POPULAR MECHANICS

"Written So You Can Understand It."

"Tells You How to Do Things."

VOL. V. CONTENTS FOR OCTOBER 03 *NO. 2*

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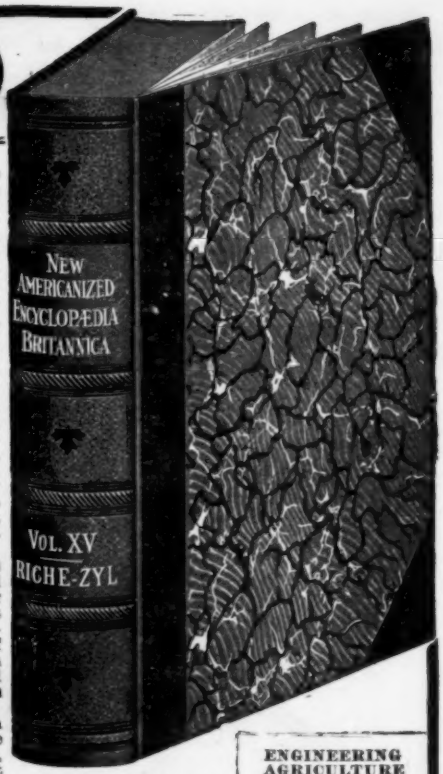

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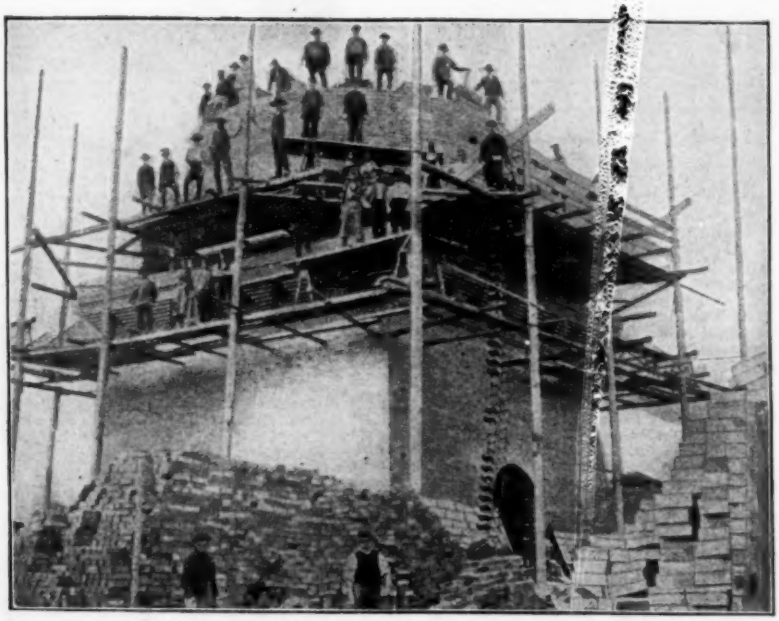
Building the Tallest Chimney in the World 450 Feet High



Base in Course of Construction

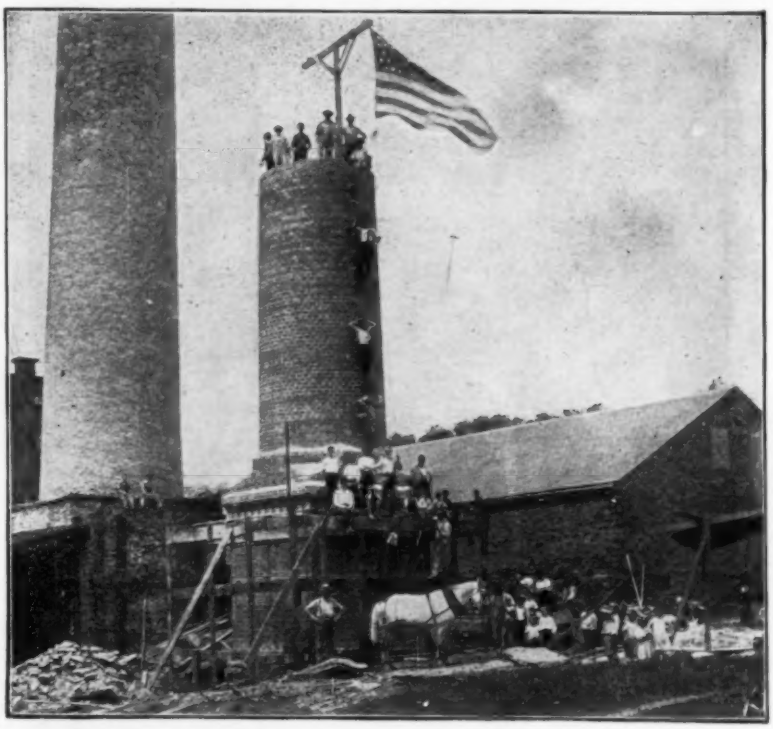
Popular Mechanics

Vol. 5. No. 2. CHICAGO, OCTOBER, 1903. 5 cents a copy. $1.00 a year.

Tallest Chimney in the World

Builder of the Colossal Structure in Germany Talks of Lax Laws in the United States

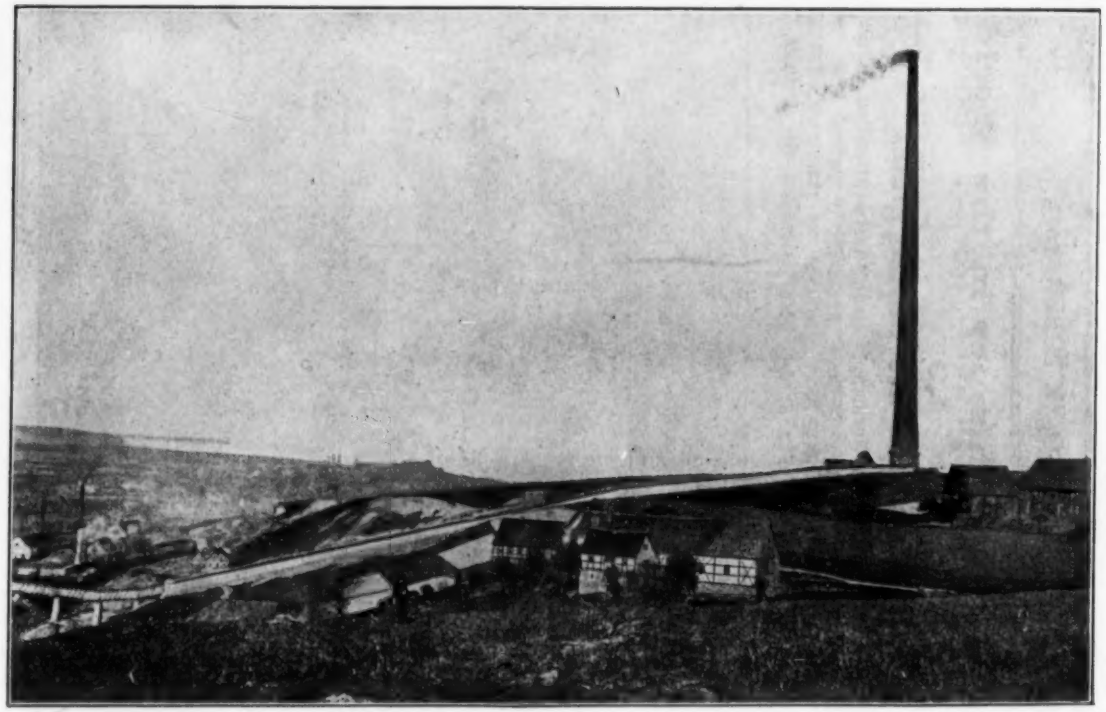
At Halsbrucke, near Freiburg, Germany, has been built the tallest chimney in the world. It is a perforated radial brick chimney of the most substantial and approved construction, and towers 460 feet above the mound on which it stands. The structure was built by H. R. Heinicke, of Chemnitz, Germany, for the Royal Saxony Smelting Works. This structure, which attracted the attention of all Germany, has successfully passed the severe tests required by the laws of that country, and Mr. Heinicke, the builder, has been commended in a letter from the Royal Building Department of Germany—an honor rarely bestowed.



Perforated Radial Brick Chimney in Course of Construction at Philadelphia

Beside this colossal shaft all the other buildings of Halsbrucke look exceedingly diminutive. It stands as a grand monu-

Tallest Chimney in the World Completed



Perforated Radial Brick Chimney Built for the Royal Saxony Smelting Works of Halsbrucke, Germany, 460 Feet High

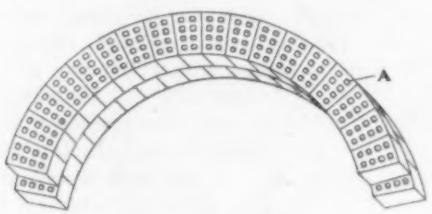
ment to German enterprise, that is visible for many miles around. Seventy feet higher than the 29-story Park Row building in New York, it has an internal top diameter of only 8 feet 4 inches. Its enormous height with its small circumference gives its a very odd and striking appearance and to the onlooker it seems in truth to touch the clouds. H. R. Heinicke, the builder of this great chimney, gives to Popular Mechanics readers the following discussion on the radial brick system of chimney construction which is now attracting so much attention throughout the world:

America Has No Law Governing Chimney Building

BY H. R. HEINICKE.

The system of constructing chimneys of circular cross-section by means of brick of special form, called "radial brick," was first introduced in Germany and immediately met with such success that it has been widely adopted by chimney builders, with the result that the old method of chimney building in the manner of ordinary masonry structure has fallen almost completely into disuse.

Owing to its design the round chimney presents a smaller area to the wind than any other type; hence it is the best form to withstand storm and save building material. Moreover, the general efficiency of such a structure is greater than that of the ordinary structure, because the frictional resistance of the walls is less. The bricks employed are of special shape, perforated and of such composition that only the best material can be used in their manufacture. They are furthermore fired to such an extent that they are exceptionally hard, heavy, resistant and weather-proof. Radial bricks are larger than the ordinary, for which reason the number of joints in the finished shaft is reduced by one-half. But the principal merit of the system lies in the fact that only by means of the radial brick can a perfectly secure bond be obtained; otherwise the joints must necessarily be very irregularly disposed. Of the utmost importance is the manner of making the



The Bond

perforations which serve the purpose of receiving the mortar tie-rods and bonds "a" by which the structure is rigidly anchored together.

In the United States arrangements have been made with leading brickmakers by which radial bricks can be made in accordance with the German system. A well constructed brick chimney costs more than an iron or steel chimney. The purchase of a steel chimney is always to the disadvantage of the owner, as he is continally at an expense for painting, etc., to keep it in good condition, and even when this is done its life is shorter than that of a properly constructed brick chimney. Owing to the lower gas temperature, caused by the greater radiation of heat from the thin walls of a metal structure, producing poorer draft, there is also a considerable loss in efficiency in a steel stack.

Of course it is absolutely necessary that a chimney be built in such a manner that it is as durable as possible. In Europe the question of chimney building is arranged by law and by ordinances of the government and city authorities; while on the contrary in the United States the matter of chimney building is left to the individual who is at liberty to employ any system he deems the most appropriate for his particular purpose, be it safe or otherwise. It is undoubtedly of vast importance that the manufacturer who contemplates the erection of a chimney should give this matter serious thought. Naturally, there are some chimney concerns in the United States who take advantage of the fact that the authorities have not any fixed rules regarding the method of chimney building. Consequently it is an easy task to obtain contracts if the bids are based on poor and weakly constructed chimneys, these being considerably lower in price. Guarantees which firms of this kind offer are entirely useless; they simply deceive the buyer. Their chimneys might withstand all actions of heat, weather, etc., during the period mentioned in the guarantee, but as a rule, later on they will develop faults and show the defects of design and construction. The wisest plan is to seek out a firm which employs the right principles and methods of construction coupled with long experience.

Auto-Chair the Latest Vehicle

Glides About Like an Automobile and May Succeed that Machine in Popularity

A great chair on wheels that will seat its two occupants comfortably while remaining stationary or will carry them about wherever they want to go as conveniently and speedily as an automobile, merely by the pressing of a lever, is the world's latest vehicle, and a machine that threatens the supremacy of the automobile. For viewing the parks, sight-seeing, shopping and general use in cities, it seems most admirably adapted.

Society has already smiled on the auto-chair, and the automobile must look to its laurels. Its manufacturers predict for it a reign of popularity exceeding that of the automobile at present or of the bicycle in its palmiest days. Soon the sight of people gliding about the streets in these swiftly moving seats will be as common as that of phaetons or buggies are now.

For sight-seeing they have no equal, as the sightseers already occupy their seats and when they want to go elsewhere the seats will carry them wherever they would journey without their having to rise. In this capacity they are to be used for the accommodation of visitors at the St. Louis exposition. A footman may accompany the chair if desired, an adjustable seat being arranged for him at the rear.

The chair takes the form of a low phaeton without a cover. There are four wheels, two large rear wheels and two small ones under the foot rest. All are pneumatic tired. The seat is upholstered in cane, as are seats on street cars, and the seats in summer railway cars. Behind the seat is a box which contains the batteries which furnish the power to operate the machine.

On the inside of the chair, attached to the arm, is a lever, which puts the chair in motion or stops it at the will of the rider. A long lever attached to the front truck has its handle directly in the center of the chair within easy reach of the driver. A gentle pressure guides the machine in the desired direction.

The most admirable feature of the entire machine is the sensitive rail which guards the chair on all sides save at the rear. This absolutely prevents accidents. When the rail comes in contact with any object, even though it weighs but a pound, it presses against a device that locks the wheels and brings the chair to a dead stop.

Around the World in 54 Days

AROUND THE WORLD IN 54 DAYS.

Henry Frederick, who left New York July 2 on the Steamer Deutschland, for a tour around the world, with the hope of breaking the record for the shortest time consumed in circling the globe, returned to New York August 26 on the New York Central railroad. He was successful in his endeavor, having made the circuit in 54 days, 7 hours and 20 minutes. In speaking of his trip he said:

"My object in making the trip was to see the quickest time a man could go around the world comfortably. The train ride from Paris to Dalny, China, consumed eighteen days. Two days were spent crossing the Yellow sea, and two more by rail across Japan. At Yokohama I missed my steamer by ten hours and lost seven days, as I was compelled to take a slow boat 2 days later which spent sixteen days on the Pacific. I landed at Victoria and crossed the continent in a little over four days. This with the Deutschland's fast time of six days across the Atlantic, made my record of fifty-four days."

Mr. Frederick said that he found the line of the Trans-Siberian railroad swarming with Russian troops, who were being poured into Manchooria at the rate of 1,000 a day.

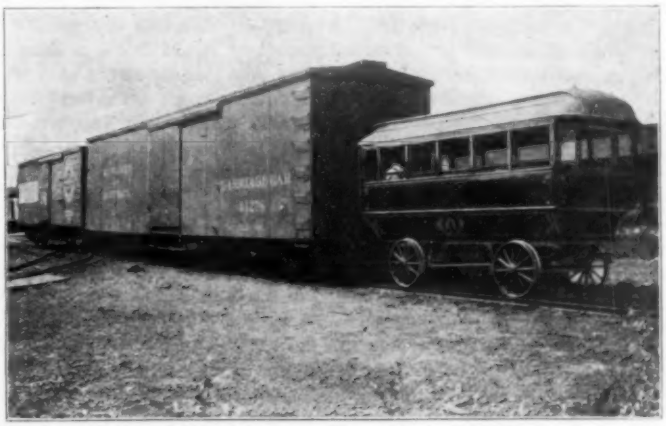
At Port Arthur were concentrated thirty-seven warships of all classes. In Japan he found the feeling for war with Russia running very high and active preparations being made for hostilities.

The entire process of catching and canning Columbia river salmon will be shown in moving pictures by the United States Fish Commission at the St. Louis fair.

Future Street Car of Small Town

Gasoline Motor Street Railway Car

A queer vehicle which has just been manufactured in Chicago is undoubtedly destined to be the future street car of small towns and other localities of light traffic. It might be called an automobile street car, or a motor street railway car or a trolleyless street car. The car is operated by a gasoline motor. It weighs 7,500 pounds, is twenty feet long over all and seats twenty-two passengers. It is driven by a two-cylinder engine of opposed type of twenty-five horsepower capacity which is extremely



Motor Car Switching Two Freight Cars

compact in its design and is capable of operating the cars up to a speed of thirty miles an hour. This equipment provides sufficient excess power for hauling trailers. One of the machines has been used by its manufacturers in switching freight cars on the side tracks in the factory yards.

The Street Railway Review says: "The cars are entirely self-contained, being operated by a gasoline motor; and they contain many features which especially adapt them for light street railway service, such as owl cars or for places where the expense of equipping and maintaining a trolley system would not be warranted by the amount of traffic."

TAKING PICTURES BY FLASHLIGHT.

To make a picture by flashlight is easier than many suppose who have not tried it, and it is advisable that every photographer should master its details, says the American Amateur Photographer.

The main things to be remembered in flashlight photography are: that the nearer to the sitter or the larger the charge of powder, the stronger is the illumination; also, that the nearer the light the harsher are the shadows; that dark draperies and surroundings require a greater amount of powder than light colors; that the background should be as far removed from the sitter as possible; that the room should be dimly lighted during exposure, but from burners behind and out of range of the lens; that if more than one flash is used, they should be discharged simultaneously, and that they, too, must be behind the lens, and, finally, that the lens should be opened just before the flash and closed immediately thereafter.

Negatives made in this way require careful development and the same subsequent handling as ordinary daylight negatives, and make possible a fund of enjoyment which only those who have experimented can appreciate.

Great care must be taken not to explode the powder in a confined condition. If confined a terrible explosion will result. More than one experienced photographer has lost his life by becoming careless in this respect. The more efficient a flash compound is the higher its explosive powder, and it should never be ignited in a confined space, not even the lid of a box, but spread in a long train. The force of the explosion is therefore minimized, while the light area is increased.

ENGLAND LOST, NOT LIPTON.

Loyalty to His Passing Nation the Weight that Held Back His Latest Shamrock

With the finest yacht the skill of Great Britain could build, Sir Thomas Lipton's hopes bearing the America's cup back to England have been blighted. Disheartened, discouraged he returns never again to renew the effort under similar conditions.

"I will never challenge again," he is quoted as saying, "until England has a Herreshoff." Sir Thomas' yacht cost much more than the American boat. He spared no pains, time or expense in its construction, telling Designer Fife to spend any amount but to build a yacht that would defeat Reliance. All England marveled at the wondrous skill and money being lavished on the new Shamrock and they thought it bound to defeat anything that floats. Quietly the Herreshoffs planned and worked. The races told the results. In no single race or "fluke" did Shamrock III. approach the Reliance. The race told the superiority of skill over lavish expenditure, of mind over money, of America over England.

Lipton, while losing the cup, wins America's hearts. All declare him the gamest, squarest sportsman that ever came from the cluster of little islands over there across the water. It was not Lipton that was defeated. It was Fife and others of the "skilled" English mechanics who told Lipton they could build a boat that would defeat the American yacht. These English designers were defeated by the Herreshoffs. Lipton was merely intrusted with the handling of the [illegible]anism Fife had designed. [illegible]f, would have won the cup but for his loyalty to the British [illegible] employing a British designer and [illegible]sh workmen to build his yacht. Lipton could not be induced to believe that England was a "dead one," that her mechanics were not as skilled as those of any other nation. With the characteristic British tenacity it has cost him $3,000,000 to learn the lesson. If Lipton had gone to Germany or France, or Norway, he more probably, with the same expenditure of money, might have secured a yacht to defeat Reliance; but never in a thousand years in England. Never will a real English boat defeat an American.

Alice Roosevelt Goes Down in Submarine Boat

First Woman to Visit Bottom of Sea and Tell About It

Alice Roosevelt has earned the distinction of being the only woman that ever visited the bottom of the sea and lived to tell the tale. She made a trip in the submarine torpedo boat Moccasin during her late visit at Newport and when she arose to the surface again reported that she thoroughly enjoyed the experience. Lieutenant-Commander Fletcher escorted the President's daughter in the journey and knowing the treacherous nature of torpedo boats, decided not to venture outside the bay in the underwater trip. Miss Roosevelt's less venturesome friends cheered as she stepped on board the Moccasin and climbed down a little hatch inside the submarine fighter. As soon as she was on board, Lieutenant Pinney the commander, ordered the hatch closed and sealed and the process of sinking the boat began. Onlookers saw the dangerous looking little craft slowly bury itself in the waves; the waters curled where it sank and the boat, crew and President's daughter were out of sight in the depths of the sea.

The boat went on down and settled on the bottom of the bay where the machinery was set in motion and worked as if the craft were under way. Miss Roosevelt watched everything with intense interest and anything she did not understand she asked about. The boat remained on the bottom about ten minutes when the rise to the surface began. The engines were stopped, the water pumped out and the Moccasin journeyed upward. There was renewed cheering when the boat was seen to again lift itself from out the waves. The hatch was opened and Miss Roosevelt, as bright and fresh as a water lily, stepped blithely from the submarine to the dock.

The Submarine Torpedo Boat Moccasin, in which Alice Roosevelt Visited the Bottom of the Sea.

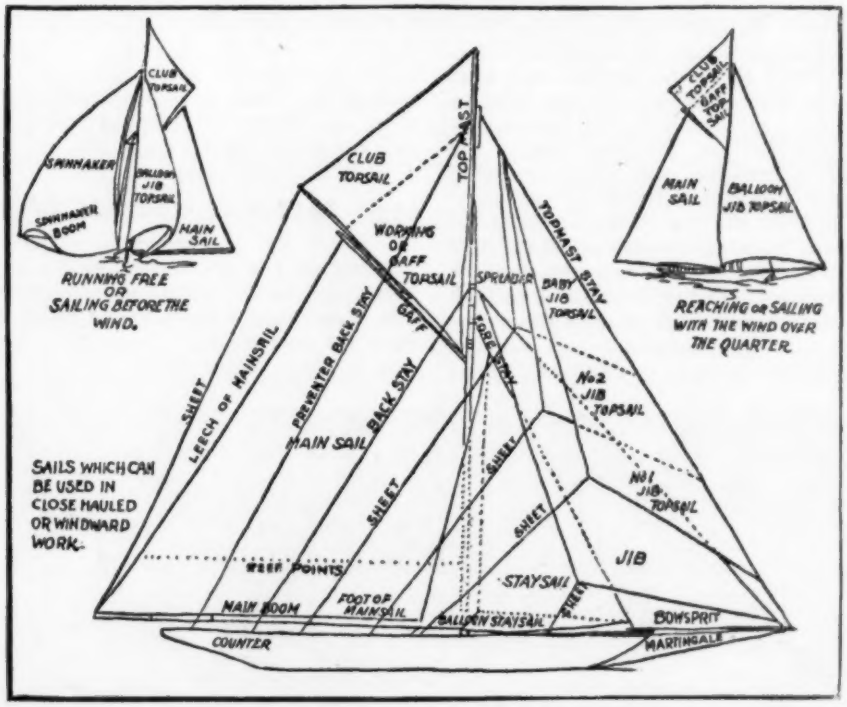
LAND BOAT FOR EGYPTIAN DESERTS.

Imitating the land ships now employed in sailing on the sands of the California and New Mexico deserts and successfully used for pleasure on the southern beaches and in many other parts of the United States, as previously described in Popular Mechanics, London has built a similar craft to be employed on the Egyptian deserts. It is called a "sailing carriage." Mr. George Winter, its designer, says:

"The vessel was tested at Hunslow and manifested all the advantages and none of the drawbacks of a yacht. In a couple of months the merits of the sailing carriage will be tried over the sands of Egypt. I believe it will prove a valuable means of communication between the scattered villages. The tires of the wheels are sufficiently broad to prevent them sinking into the sand. Ordinary rough ground will not stop it, for in the Hunslow trials it took a ditch without disaster.

"Should the wind fail, the mast can be used as a carriage pole for a pair of mules, and the carriage proceeds in the ordinary prosaic fashion."

All the Sails of a Yacht



The above illustration is interesting and instructive in view of the increased interest of late years in Yacht Racing

Brigham Young Founded An Empire

He Was the First American Irrigator--Work Begun By Him Now Taken Up By the United States

A new nation has been born in the United States. Its father was Brigham Young and Uncle Sam and Columbia are its foster parents. To the National Irrigation Congress has been intrusted its tutorage and cultivation. This nation is the great desert land of western America—a land four times the size of all France, and greater in extent by far than all our newly acquired insular possessions.

Brigham Young sixty-six years ago founded the new land that is to add an empire to the United States. Brigham Young, the first irrigator, sixty-six years ago, turned the waters of City Creek on the Land of the Desert and on the land he thus reclaimed from an alkali waste the irrigation congress met a few days ago. Delegates to the congress at Ogden, Utah, saw a thriving city where once the sands beat across a trackless waste. The surrounding country they saw waving in vines and grain, and this was once the heart of the desert. All Utah they beheld in prosperity and those who visited Salt Lake City saw a municipality reared from the sands that would have put to shame many of the cities the delegates called their home.

What Brigham Young could do the United States government believes it can do, and so through the aid of the many able and wise men who attended the congress on the land that Brigham Young reclaimed from alkali, the government has taken steps to reclaim all the waste land in the vast western desert. The national irrigation law has already been passed. The public lands affected by the act lie in sixteen different states and comprise 13,000,000 square miles.

The Chicago Tribune says: "There is being formed a nation within a nation. When that nation is formed, will there be a monument to Brigham Young, the first American irrigator?"

Grandest of All Mountain Roads

Cars Climb a 48 Per Cent Incline 6,000 Feet Above the Sea

No other part of the world has a mountain road to compare in the magnificence of its ascent and descent and the grandeur of the wild scenery on either side, to the Mount Lowe railroad in southern California. Three thousand feet in length this remarkable road reaches up an incline of 48 per cent to the top of the mountain 6,000 feet above the sea. The starting point is in the beautiful valley of San Gabriel from which there is not a perceptible curve until the mountain's top is reached.

The queer cars that climb this mountain's side are pulled by cables operated entirely by waterpower. In constructing the road two sources of water supply were available under widely different conditions as to head and quantity, both of which it was desired to utilize. One of the streams comes from the summit of Echo mountain, with a fall of 1,250 feet, and the other from Rubio canyon, with a fall of 287 feet, the water from each being brought down to the station in separate lines of pipe and applied to the wheels separately. The power station consists of two Pelton wheels mounted on the same shaft with iron housing and bed-plate.

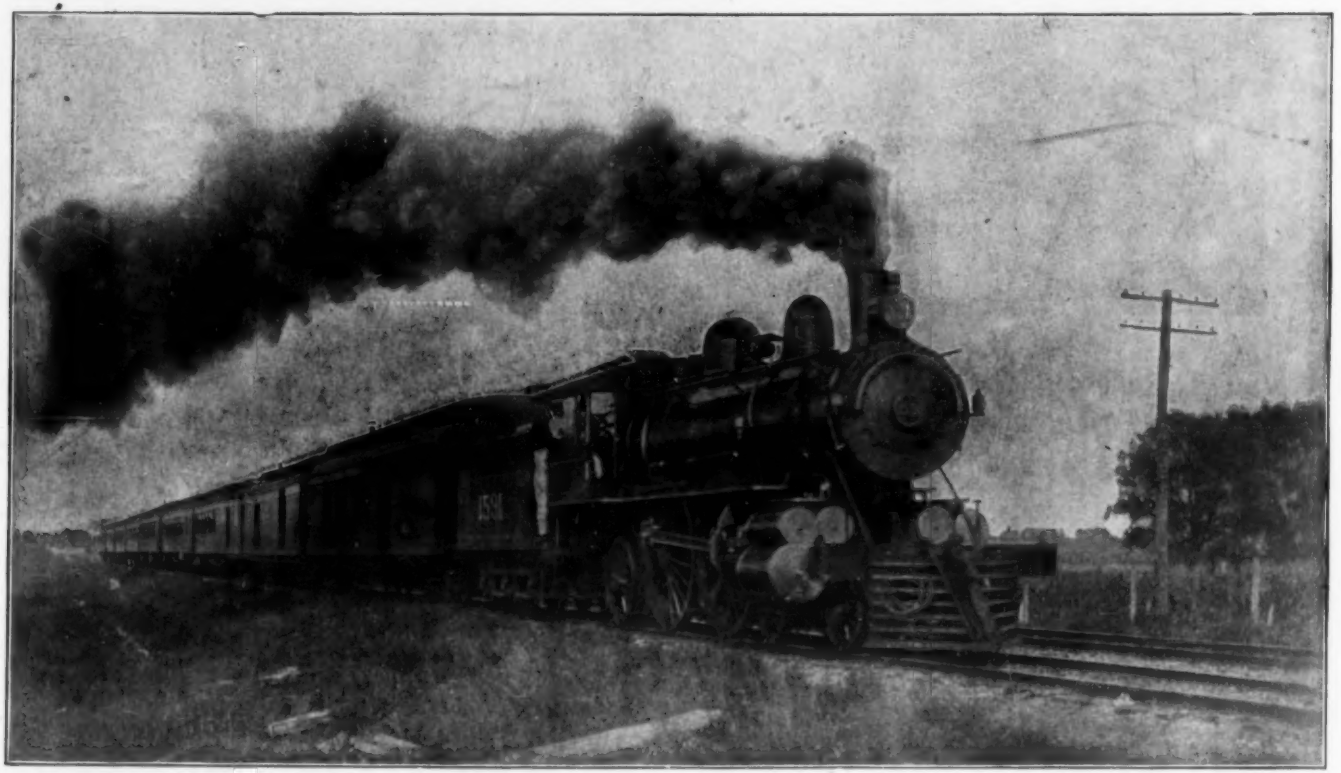
The high-head wheel is 40 inches in diameter and develops 100 horse power with a 7/8-inch nozzle, while the wheel for the lower head is 19 inches in diameter. To these are applied two streams developing 50 horsepower, both wheels running at 800 revolutions, the varying diameter being necessary to give the same speed and still conform to the velocity due to their respective heads. The power developed is transmitted to the top of Echo mountain where it drives the hoisting machinery of the cable incline here shown.

Mount Lowe Railway

CHEAP PHONE IN DARKEST AFRICA.

The telegraph system of Uganda in Central Africa now extends to Batiaba, on the shore of the Albert Nyanza. The trunk line from Mombasa, with its branches is more than 1,034 miles in length, and the charge over the whole distance is 4 cents a word with a minimum of 1 shilling and 4 pence (32 cents) for a message of eight words. There is also a system of telephones along the whole distance which may be used at 32 cents per conversation. The poles on which the wires are fixed are living trees.

Like a First-Class Hotel on Wheels



Overland Limited No. 1 Speeding to the Land of the Setting Sun

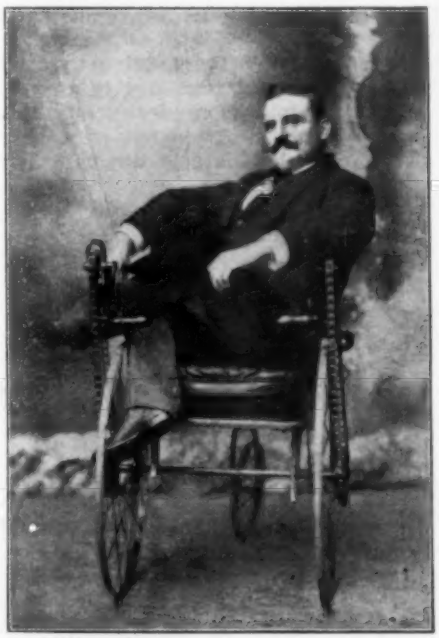
PRIDE TRAIN OF THE U. P.

From Chicago to San Francisco in three days is the regular schedule time of the "Overland Limited No. 1," one of the finest and fastest of trans-continental trains. This, the pride of the Union Pacific, is a vestibuled train and consists of handsome observation, drawing-room, dining and sleeping cars, fully equipped with libraries, reading and smoking rooms, barber shops and bath rooms, making it a first-class hotel on wheels.

The locomotives used are of the ten-wheel passenger type, and the trip of 3,326 miles is covered in 72 hours and 25 minutes. The roadbed is exceptionally good and care is taken to keep it in first-class condition. The picture is from a point on the road about four miles from Kearney, Neb.

FIVE THOUSAND MILES IN AN INVALID'S CHAIR.

Five thousand miles through the country in an invalid's chair is the remarkable feat performed by a Chicagoan, James L. Hornabos. The trip was made from Chicago to San Francisco and return in a circuitous route, Mr. Hornabos only riding in the train while crossing the desert. It required eight months to perform the feat, but the tourist stopped over as long as he desired at all the interesting places en route; spent quite a time fishing and hunting and journeyed leisurely while on the way. Mr. Hornabos says it was one of the most enjoyable trips of his career and would like to take it again if his time would permit.



Man Who Traveled 5,000 Miles Overland in an Invalid's Chair

SWIMMING AND DIVING IN ENGLAND.

In England, where swimming and diving have grown to be very popular sports of recent years and have obtained royal favor, many scaffolds like the one shown in the illustration are built for public diving exhibitions. The judges occupy the second story of the apparatus and give instructions through the megaphones to those in the water. Through these the time is called, swimmers are ordered to turn and results are announced to the swarm of spectators that line the banks. The photograph here shown was taken by a Popular Mechanics representative as four contestants in midair were diving into the water at the same time.

High Diving Contest in England

Growth of Industrial Art

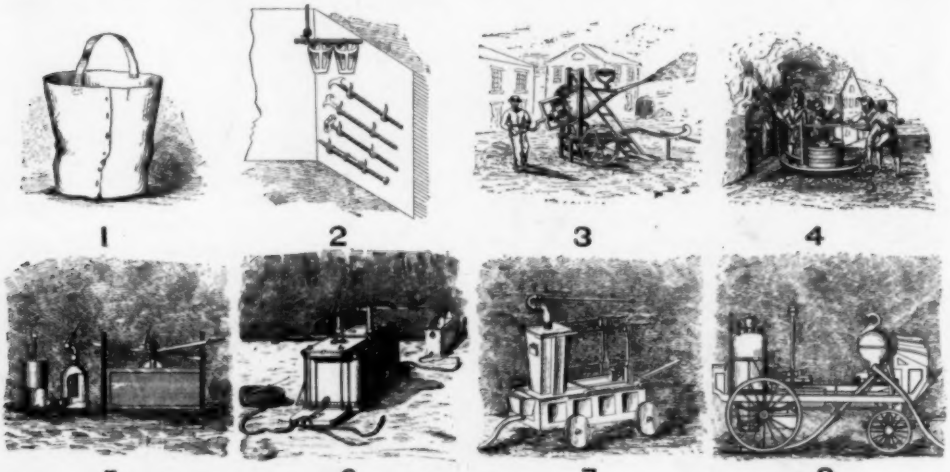
This is the third of the series of illustrated articles being presented by Popular Mechanics on the growth of industrial art. After laborious research and considerable expense the publishers have been able to obtain pictures and data describing the evolution of all the important mechanical devices that make up our present day commerce. All these devices, as the articles will show, had their beginning in crude conceptions. The description and illustrations of these will be of intense interest to those of inventive minds, as showing the quaint creation that probably merely furnished the idea of which the present useful device is the outgrowth. Many of the "progenitors" of our modern machines were little more than toys. Many of them were ridiculed even by people of their day and their inventors held up to derision. But the principle on which they were based led to important discoveries that often have revolutionized the industrial world. Even now many such originals are being born every day, most of them to receive jeers or mere passing notice, but probably to figure conspicuously in the world's industry in after years.

The reader will doubtless appreciate that it was a search of world-wide scope that enabled Popular Mechanics to obtain the illustrations and data contained in this series. Libraries of foreign lands and numerous historical archives and private collections were searched in the effort. For our success we are indebted for the assistance rendered us by the London Institution of Civil Engineers, the "Centralblatt der Bauverwaltung," of Berlin, the French "Societe des Ingenieurs Civils," of Paris, the American Society of Mechanical Engineers and the American Society of Naval Engineers.

History of Fire Fighting Devices

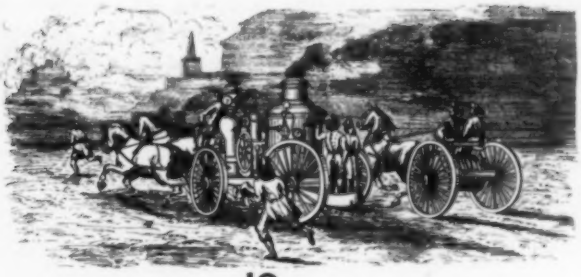
Marked Slowness of Progress Considering the Importance and Age of Inventions

Fire has been the enemy of man's abode ever since he began living in houses, and the further civilization advances the more destructive and implacable does this foe become. So since the beginning of civilization people have devised various methods of fighting this most persistent and deadly antagonist, but strange to say less ingenuity has been displayed and less progress made than in almost any other line of mechanics, until of recent years. With all the improvements and skillful fire fighting apparatus that have appeared from age to age, fires cause many fold more destruction today than ever before in the history of mankind. This, of course, is largely due to the un-



No. 1. Primitive Water Bucket
2. Primitive Fire Syringe, Buckets, Etc., 2d and 3d centuries
3. Primitive Fire Syringe—1568
4. Primitive Single Acting Pump—1600
5. Primitive Air Chamber Engine—1633
6. Primitive Detachable Section Hose—1672
7. Hand Fire Engine—1725
8. Steam Fire Engine—1829

9



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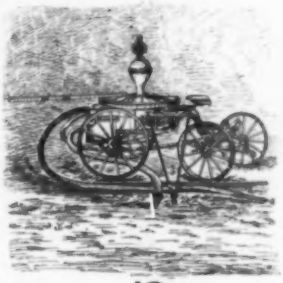

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No. 9. Hand Fire Engine, United States patent—1334
10. Steam Fire Engine, United States patent—1868

No. 11. Water Tower, United States patent—1860
12. Horse Power Engine, United States Pat. 1882

substantial nature of the buildings and not wholly to the inefficiency of the fire-fighting machinery or the fire departments.

The oldest known fire engine is that of the Herod, 105 B. C., and for the description it might stand for the ordinary form of hand engines yet used in many small towns. The streams united in a common discharge pipe passing up a trunk, in which was an air chamber, and out at a nozzle, which was capable of being pointed in any direction.

The Fire Brigade of Imperial Rome consisted of 600 firemen, organized by Cæsar, 72 B. C. The "sipho" of the Romans is referred to by Pliny. Strabo alludes to the siphons which were kept in houses as protection against accidental fires; frequent references are made to this devise but its construction seems to be unknown. Appolodonus recommended a leather bag, containing water, with hollow tubes for nozzles.

The first notice of the fire engine in modern times is that of the "water syringe," which was used in 1518. It was mounted on wheels and worked by levers.

The fire engines of Nuremberg, Germany, were mounted on sleds 4 by 10 feet, and drawn by two horses; they had cisterns 2 by 8 feet, in which were two horizontal cylinders; the brakes were worked by 28 men and the combining streams from the cylinder issued from a 1-inch orifice and reached a height of 80 feet.

Thomas Grant obtained an English patent on a fire engine in 1632. Van Der-Heyden of Amsterdam is credited with having brought the machine in 1663 to the present form of rural hand engine.

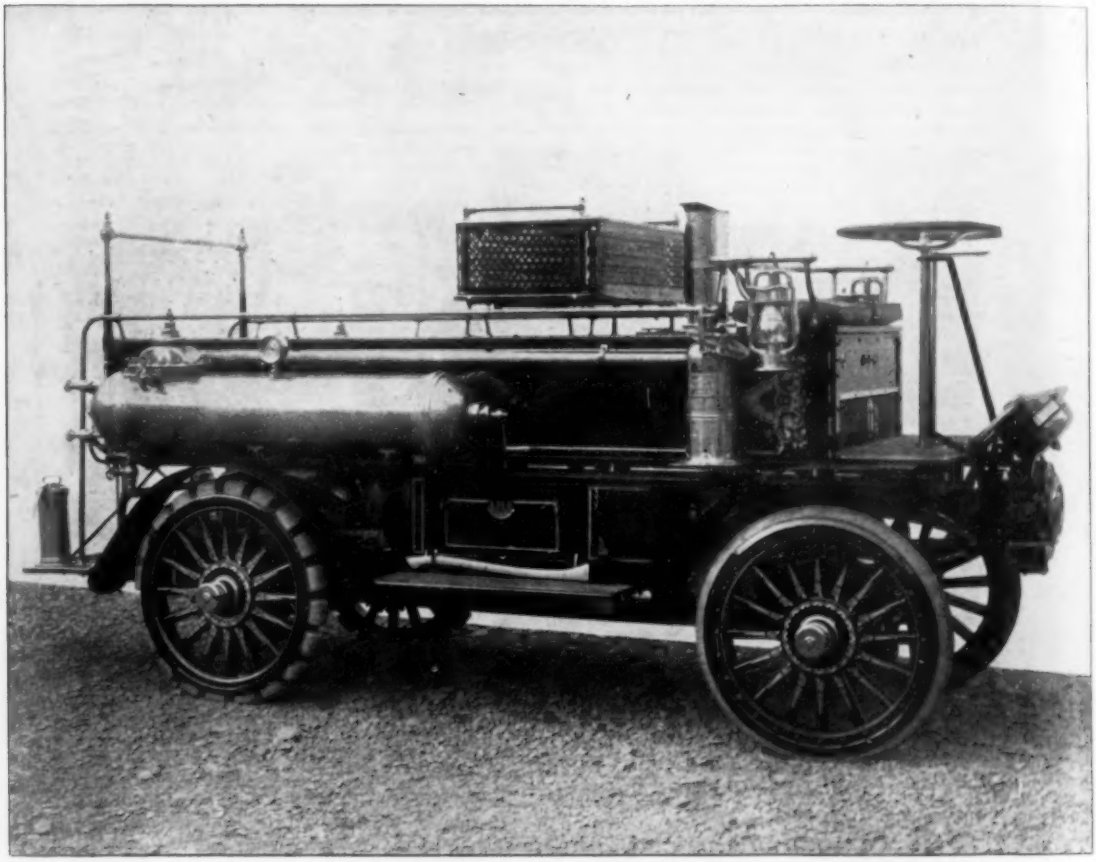
Leathern hose in detachable sections was invented by the brothers of Van Der-Hayden in 1670. Hooks and fire ladders came into historic notice about 1699, although it must be assumed that they were long before in use. Fire plugs were first introduced in the streets of London in 1710. Toward the close of the 17th century the double cylinder portable pump with air chamber was introduced into England by Newsham. The application of steam power to work fire engines was first attempted in 1830. The Newsham engine was improved from time to time and was in use in London in 1832.

Steam power for extinguishing fires was in use in manufactories many years before it was employed in portable machines. Capt. Ericsson built and exhibited a portable steam fire engine in London in 1830. In 1841 a steam fire engine was built in New York City. Its great weight, however,

proved to be a fatal objection to its use. In 1842 or 1843 Capt. Ericsson produced an engine in New York which was tested but not brought into regular service. It delivered 9,000 gallons of water an hour to a height of 90 feet, through a ⅞-inch nozzle.

of pumps; grate surface, 16 feet; heating surface, 560 feet.

The latest fire fighting machine is the automobile fire engine shown in the halftone illustration. It is a combination fire engine and hose wagon and is destined to supplant the horse engine on all the fire de-



The Automobile Combination.—The Latest Fire Engine

The city of Cincinnati, O., was the first to adopt steamers as a permanent portion of its fire department. These engines and the Cincinnati system were copied in the principal cities of the world. The steamer "Citizen's Gift" was built there in 1853 and in 1866 showed a record for time of raising steam, 3 minutes and 40 seconds; size of nozzle 1½ inch; distance thrown 310 feet, measuring from end of nozzle to where solid water fell; size of steam cylinder 10-inches bore, 24-inch stroke; pump 6 inch-bore, 24-inch stroke; length of hose, 100 feet; steam, 100 pounds to square inch; pressure on water cylinder, 240 pounds to square inch; speed of engine, 110 revolutions, 220 strokes

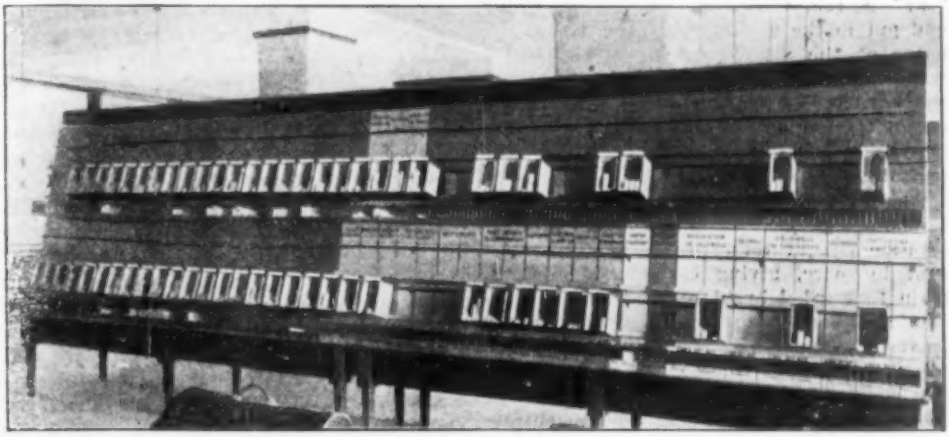
partments of importance in the United States.

The Western Fireman, describing the new self-propelling machine, says: "It is strongly built, takes up little room, is always ready for use; it travels at the rate of 15 miles an hour; it is under easy control; moves with greater safety through crowded streets than a horse wagon; costs little to keep in repair, and saves feed bills, veterinary's bills and all the incidentals to the keeping of horses. Automobile fire apparatus is another important step in advance and its general adoption is merely a matter of time."

Keeping Track of Perishable Freight

Ingenious New System Shows the Exact Location and Condition of Every Car on an Entire Railroad System

Keeping track of the thousands of cars of perishable freight, such as fruits, meats, produce, etc., that are hurried over American railroads with the speed of passenger trains, is a necessary task that has from time to time given birth to some ingenius conceptions. Probably the most remarkable



This Board Shows the Location of Hundreds of Cars of Perishable Freight

of these is found in the new systems installed on the Rock Island and the Great Northern railroads. A time-freight board that seemingly places every car on the system of thousands of miles within the fingers' reach, and denotes the route, location, destination and condition of each, has been installed on both these roads. Describing the one in operation on the Rock Island, the Railroad Gazette says:

Under normal conditions, with no extraordinary interruptions, the board serves as a detective, keeping track of the individual car of freight in a way that is designed to admit of no neglect or oversight; and under unusual conditions, such as the recent freight congestion, and the floods, the board has proved of peculiar service.

It is 21 feet 6 inches long and 5 feet high, surmounted by a name-board 6 inches high. There are two parts, one for westward trains and the other for eastward.

The board carries boxes and blocks to represent the fast-freight movement of the entire system, or 6,119 miles of road. The method of dividing it is apparent from the engraving. It should be explained that a working arrangement of the board is not shown by the engraving, the boxes having been ranged in this way so as not to obscure the lettering. Main lines and branches are distinguished one from the other by contrasting colors. For instance, the upper half of the board represents the main line from Chicago to El Paso, which runs via St. Joseph and also Kansas City, the former being the main line. The branch via Kansas City is therefore given a light color, readily discernible in the engraving.

Each division terminal has a single space, and the part of the line between two such terminals has a single or double space, as may be necessary. There are four rods or pipes on each side of the board on which the trains, represented by the boxes, are run. The boxes are swung to the rods by hooks and are moved from point to point as the trains move over the road, advice regarding their movements being received from terminal points.

Each car of time fright is represented by a block of distinctive form, which is placed in the box representing the train containing that car, a box having capacity for 64 blocks. Each block has a small colored tag inserted in a groove running across its end, on which is written the number of the car. On the face of the block are two other grooves or slits into which is slipped a card

on which is written the car number, contents, destination, loading point and train in which forwarded. The colored tag on the end of the block also indicates the kind of freight in the car. Meat, for example, is represented by a bright red tag so that at a glance one is enabled to tell how many cars of meat are in time freight trains, and how many have been set out and are standing on side tracks. The receptacles for set-out cars on the board may be seen in the engraving. In case a car is set out at any point, either at or between terminals, the "car" is removed from its "train" (box) and put in the set-out receptacle under the name of the station or locality where it was set out. A telegraphic report advises the car service department of the setting out of the car and the reason therefor. The department then sees to having the car picked up as soon as possible.

At the initial point of a train a report is made out by the agent, showing all cars of time freight forwarded. This report is sent by wire, giving car number, initial, train forwarded by, date, contents, destination and junction point at which the car leaves the line; and if perishable freight, the name of consignee. All of this information is entered on the slip carried by the block representing the car. On the outside of the box representing the train is a tin receptacle for holding a card giving the scheduled and the actual time made by the train. When cars have reached their destination, the slips are taken from the blocks, the schedule card is taken from the side of the box, and the two put together and filed, so that at any time any information asked for in regard to the cars in this particular train can readily be given.

It takes about 150 boxes for the regular trains moved on this board.

THE ACTION OF ELECTRICAL SHOCK.

A report has been made by Dr. F. Battell, of the University of Geneva, upon the precise nature of the effects which cause death from electric shock, and it would seem from this that currents of high tension cause death in a different manner to currents of low tension. The electrical Review abstracts the report as follows:

Currents at a pressure of about 12,000 volts or more kill by inhibition of the nerve centers and arrested respiration. The heart continues to beat with energy, and is only arrested by asphyxia, causing great arterial pressure. In such cases the animal may, in general, be restored by artifical respiration. On the other hand, currents of low tension, not exceeding 120 volts, and passing from the head to the feet, kill by producing paralysis of the heart, and the animal continues to breathe for some time after becoming unconscious. These low-tension currents apparently stop the heart by causing irregular contractions, thus disturbing its rhythm. Dr. Battelli and Professor Prevost have made the discovery that high-tension currents are capable of restoring the action of the heart that has been arrested by a low tension current; but as the application to be successful, must be made not more than fifteen or twenty seconds after the arrest of the heart's action, it is hardly likely to prove valuable as a practical restorative. The path traversed by the current in passing through the body is a matter of great importance. The most dangerous is from one hand to the other, because the resistance of this path is low, and because the current passes near the heart. Hence, it is a good rule for workmen and others handling live conductors to use but one hand. An important rule to observe in rescuing a person in contact with a live wire, and when it is impossible to cut off the current, is to push the victim off with one foot.. Even should the current pass from one foot to the other through the rescuer, the resistance of the path is considerable, and as the current does not pass near the heart, serious injury is not likely to result.

WHAT THE BUGS COST US.

We keep an army of 65,000 men and have 254 ships of war. We are ready to fight any nation on the earth, yet the little potato bug laughs us to scorn. Ever hear of the big United States suffering with the grasshopper? Are we not powerless before the gypsy moth? The bug family taxes this great country $350,000,000 a year, but in the unequal fight between the nation and the bugs the latter ever remain unconquered. The worms that attack the cotton plant assess the farmer $60,000,000 a year. The potato bugs eats $8,000,000 worth annually out of our gardens. The chinch bug costs us $100,000,000, the Hessian fly $50,000,000, and the grasshopper $90,000,000. The big United States hasn't enough money or men to win any war with an insect.

Future of Wireless Telegraphy

May Link All the World so Closely Together that the Inhabitants Will be Like the People of One Great Municipality

MARCONI AT HIS INSTRUMENT ON THE PHILADELPHIA

To join in communion the known with the unknown world; to obliterate distance in conversation; to bring all mankind within speaking distance; to bring the whole world closer together than are now the inhabitants of a single state. These are some of the possibilities that suggest themselves when we observe the rapid strides of progress Marconi's invention is making.

It has been demonstrated that the cheapness of installation and operation of wireless telegraphy will make it available for keeping in constant communication with the most isolated parts of the globe. The newspapers are destined to receive daily accounts of happenings from regions whose current affairs are now unknown to us. Already the nations of the world are recognizing this remarkable contingency, and wireless stations are rapidly being built in many of the most distant lands. The first natural application of wireless telegraphy is for intercourse with distant and inaccessible points, and for all uses to which wires are prohibited by natural limitations. Ships may talk with each other at sea or with the shore. Wireless telegraph stations are being installed in distant, inaccessible regions where the erection of wires is impracticable owing to the climatic and other natural conditions, as in South Africa and Alaska. In South Africa hostile tribes of blacks, destructive insects and fever-laden atmosphere made the maintenance of wires dangerous and unprofitable. In Alaska the ordinary telegraph line was rendered practically impossible because of the extreme cold and the long stretches of uninhabited regions.

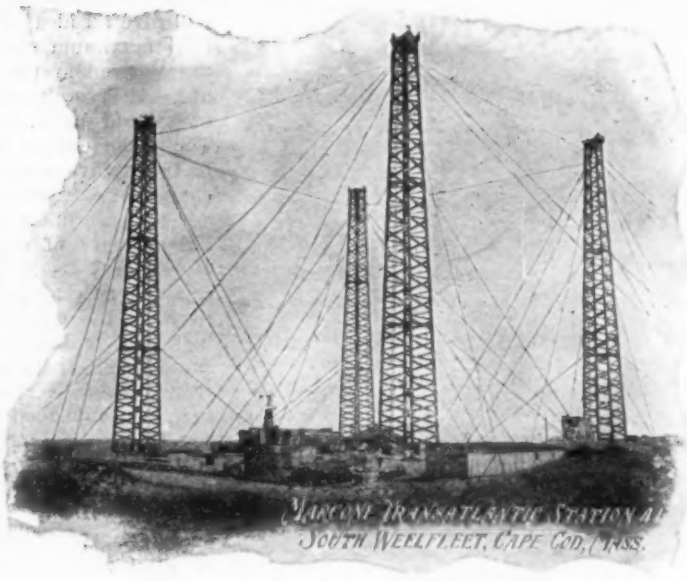
A wireless station has been established at the mouth of the Tanana river, at Fort Gibbons, on the Yukon river in Alaska. The stations erected in South Africa have been of immense service to the English government and opened up a new field of information. The people of Canadian Yukon and of British Columbia have signified their willingness to contribute the cost of installing the requisite stations for wireless connection with the rest of the world, and the towers are to be erected in a short time. The American Marconi Company is under contract with the United States government to erect and install three stations in Alaska. The Dominion of Canada abounds in isolated communities cut off from rapid communication with the outside world. The Klondike, the outposts of civilization in Manito-

MARCONIS
WIRELESS
TELEGRAPH & C.
WORKS
CHELMSFORD.

INTERIOR OF WORKS

ba, British Columbia and the Northwest Territory hold out many alluring inducements. The fisheries, canneries, mines and sealing stations of the Aleutian Islands and northernmost Alaskan coast will doubtless soon have Marconi stations for commercial purposes.

Wireless telegraphy may lead to the discovery of the north pole, as is now planned. Stations are to be built at intervals along the route, and thus the world may be kept constantly informed as to the progress and send relief when needed. In crossing the desert and in all kinds of voyages of exploration and discovery wireless telegrams will be of inestimable service and will lead to great advancement in history and science.



All these things seem possible because of the cheapness of installing and operating the Marconi system. The wireless telegraph station at Table Head, Glace Bay, Nova Scotia, illustrated in the September issue of Popular Mechanics cost $100,000. This has with it all the potentialities for communication with Europe possessed by a cable costing more than $4,000,000. The station at Poldhu, in Cornwall, England, will not cost more than $100,000 when fully equipped for receiving and transmitting messages. The station at present is only supplied with apparatus for receiving. Others of the stations that have been built represent

even smaller outlays and it is believed that the cost will diminish as wireless telegraphy is advanced and simplified.

As to the cost of operation, here are some facts regarding stations already built that will give an idea of its economy: The practical maximum speed thus far attained by the Marconi system is thirty words a minute. An average of eighteen words a minute would be a safe basis of calculation. The cable charge for transatlantic service is twenty-five cents a word. Assume the charge of wireless message to be an average of ten cents a word and the daily earning capacity of one station is more than $2,500, or $925,000 per year. This earning capacity may be doubled by the increase of speed to the maximum attained; it may be increased tenfold if it prove true that the same results may be attained in transmitting messages across the Atlantic that have been accomplished in transmitting across the English channel. It was there demonstrated that multiplex transmission is as possible by the wireless system as by wires. Messages were sent and received simultaneously from both sides and messages in various languages were simultaneously transmitted from one station and accurately received at the other during the very time that messages were in transit in the opposite direction. All this was attained without hitch or flaw. It remains to be demonstrated that this can be done in the long distance transmission. Signor Marconi believes that it can.

There are fourteen Atlantic cables in operation. The combined capacity of these cables is less than 20,000 words per hour. when the first cable was installed its capacity was sixty words per hour. The first wireless station easily maintained an average of 420 words an hour. A maximum of 1,800 words an hour was attained and Marconi believes that this figure can be made the average. If this be true then twelve wireless stations will transact as much business as fourteen cables. The total cost of installing these twelve stations will be less than $2,500,000, as against a cost of approximately $60,000,000 for the cable lines. The cost of maintenance and repairs, so great an item of cable expense, is in the case of wireless telegraphy practically nil.

With the development of a system of intercommunication between continents as rapid and economical as this promises to be will arise new uses and applications which will increase the business in progressive ratio to the reduction in cost and increase of speed.

The low cost of installation and operation it is believed will fully warrant the investment in planting wireless stations in every quarter of the globe, no matter how remote from civilization, and wireless stations will form part of the equipment of every ship that floats.

BALLOONING IN PARIS.

Deadly Dueling in Midair Recalled.

September was a great month for ballooning in Paris. Santos Dumont now shows such absolute control of his dirigible airship No. 9 that he goes home to breakfast in it, and at a children's fete in Bagatelle he inspired such confidence that a 9-year-old American boy, Clarkson Potter, with the consent of his mother, went up a short distance into the air with him.

Speaking of it afterward the child said it was a "lovely" sensation and he would go anywhere with Santos, only he would like a more comfortable seat.

The boy was the envy of all other children, who cried "Me, too," until Santos fled sky-ward incontinently.

Also for the first time Santos Dumont made a night ascension, lighting his path with a powerful acetylene lamp. During this trip the guide rope was kept trailing on the ground to aid in directing the balloon.

Lebaudy's Juno made a distance record of ninety-eight kilometers (sixty-one miles) with three in the car. The time was two hours and forty-eight minutes. The airship was under perfect control.

The ballooning experiments recalled the fact that June 22 was the ninety-seventh anniversary of a remarkable duel in the air, which was watched by thousands of spectators in the Garden of the Tuileries. Messrs. Grandpre and Lepique quarreled over Mlle. Tuevit of the Imperial opera, each had a balloon built and they went up with their seconds armed with blunderbusses. At a high altitude the signal for firing was given. Lepique missed, but Grandpre pierced the silk of his rival's balloon, and both principal and second were dashed to death. Grandpre continued his ascent, finally descending nineteen miles from Paris.

Nearly 2,000 skilled workmen in wool and silk novelties left Roubaix-Tourcoing, France, during the past year for the United States. Many are now employed in America by manufacturers who have come from Roubaix.

TELEGRAPH OPERATORS WORK MECHANICALLY.

Thomas A. Edison believes there is no worker as mechanical as the telegraph operator. In an argument over this point with a couple of friends the other day he told the following story:

"One night, when I was a 'cub' operator in Cincinnati, I noticed an immense crowd gathering in the street outside a newspaper office. I called the attention of the other operators to the crowd, and we sent a messenger boy out to find the cause of the excitement. He returned in a few minutes and shouted out:

" 'Lincoln's shot!'

"Instinctively the operators looked from one face to the other to see which man had received the news. All the faces were blank, and every man said he had not taken a word about the shooting.

" 'Look over your file,' said the boss to the man handling press stuff.

"For a few moments we waited in suspense, and then the man held up a sheet of paper containing a short account of the attack on the president. The operator had worked so mechanically that he had handled the news without the slightest knowledge of its significance."

TO TEST TURBINE ENGINES.

The naval board of construction has approved the recommendation made by Rear Admiral Melville, lately retired, that a trial be made of the new turbine engines by placing them in a scout ship, to be used for experimental purposes by the bureau of steam engineering.

If the suggestion meets with the favor of Secretary Moody, Congress will probably be asked for an appropriation of $300,000 for the construction of a ship of about 5,000 tons, to be equipped with turbine engines of the approved pattern. Rear Admiral Melville, while not committed to the new type of engine, believes it should be given a thorough trial, in view of the promising character of experiments on commercial vessels.

Attention is called by Rear Admiral Melville to the simplicity of parts, the ability to rapidly utilize superheated steam, and the increased speed attainable by the use of turbine engines. Plans for a scout ship of the required size have been drawn and have received the approval of the board of construction.

PULQUE MEXICO'S NATIONAL DRINK.

Its Manufacture is a Great Industry and Its Origin is Romantic

What beer is to the German, absinthe to the Frenchman, ale to the Englishman and whiskey to the Kentuckian is pulque to the Mexican. Pulque is a beverage made by fermenting the juice of the maguey plant, a species of agave. It has a disagreeable odor not unlike that of

Drawing Pulque

putrid meat. Mexicans draw the sap from the plants with their mouths and deposit it in a sack-like receptacle they carry with them. After a process of fermentation for 24 hours the sap becomes pulque. One plant will yield from 100 to 150 gallons of the juice. Twelve pints a day for three months is obtained from a good plant. The manufacture of this drink is one of the leading enterprises of Mexico. The City of Mexico alone consumes 100,000 pints every day in the year. In the little state of Hidalgo the maquey plantations are valued at $8,000,000.

From the same plant the more fiery and intoxicating dring, Mescal, is obtained. It is made from distillation from the root of the pulque magua and from the central part of another and smaller

variety of the plant. Tequila is simply a brand of mescal. It derives its name from the famous plantation called Tequila, where it is produced.

Tropical Truth, the bright exponent of the tropics, thus tells of the origin of pulque:

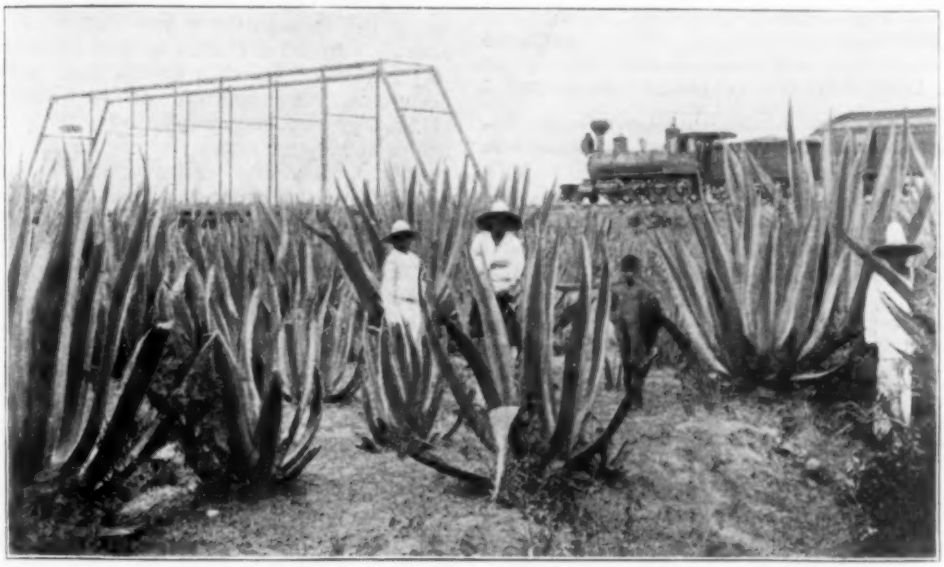
"There was once a Toltec chief named Tepaulcatzin. He lived and died in ten hundred and something. At the court of this chief, here in Tula, was a nobleman named Papantzin. He was the father of pulque as well as of a very beautiful daughter named Xochitl, called the 'Flower of Tula.' To the monarch he sent a sample of the new beverage with his compliments, by the hands of his daughter. The chief was delighted with the drink and with the daughter, to say nothing of the compliments. He asked the maiden to make her home at the palace, and she returned not to papa Papantzin, who mourned for a while, but afterwards became reconciled, and likewise became the grandfather of a prince, who in time took the throne of the Toltecs. Mrs. Tepaulatzin didn't like to see the son of the Flower of Tula take the throne away from her own boy, and there was a family row, which resulted at last in the downfall of the Toltec tribe.

"You'll see a beautiful picture of the great event of the presentation in the art gallery at the capital."

The United States produces 63 per cent of the world's cotton.

SUBMERGED COAL.

Experiments intended to determine the practicability of preserving steam coal by immersion in sea water were begun at Portsmouth, England, two weeks ago. Twenty-one tons were selected from the same stack, and divided into three lots, two of 10 tons and one of one ton. The 10-ton lots are to be further divided—five perforated cases, each containing two tons, being submerged, while five mounds, each of two tons, will be protected on shore by tarpaulins. The one-ton lot is to be burned later, when the calorific and evaporating qualities are to be carefully noted by the officers who are entrusted with the trials. No further test will be made for twelve months, when one of the submerged lots will be tried in competition with one of the mounds stored on shore, and the results will be compared with those obtained at the combustion of coal drawn fresh from the stack. Further trials with the selected coal will be made from time to time.



Maguey Field

The French submarine torpedo boats gave a fresh demonstration of their prowess recently by "torpedoing" the steamers Bretagne and Champagne as they neared Havre.

Every country in South America has consented to exhibit at the Louisiana Purchase Exhibition.

Popular Mechanics

"Written So You Can Understand It"

PUBLISHED BY POPULAR MECHANICS CO.

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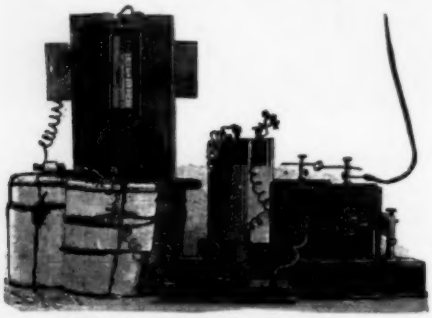
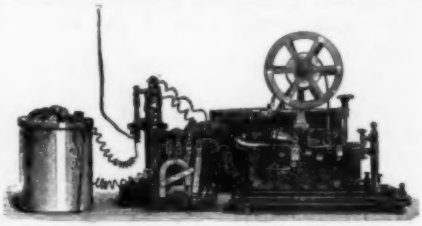
WIRELESS FIRE ALARM.

And now we have a wireless fire alarm telegraph. If the invention of Emile Guarini, recently tested in Berlin, comes into general use, as seems likely, a great advance will be made over the present system of sending in fire alarms. The new method requires no lines of wire which are always liable to be broken or get out of order just when needed. Neither does the



Transmitter for Wireless Fire Alarm.

new system need the services of a watchman to discover and send in the alarm. The sending apparatus works automatically the moment the fire breaks out, thus saving much valuable time. Firemen say they can accomplish more during the first ten minutes of a fire than in the next hour. The alarm outfit can be moved about and placed in temporary use wherever needed. In the sending machine is a very sensitive thermometer in which the mercury rises and completes the electrical circuit and starts the machine at work. At the receiving station a gong sounds and the location of the



Receiver for Wireless Fire Alarm

fire is registered on a tape. The Scientific American says:

To avoid calling out the force unnecessarily the transmitter is provided with an audible annunciator situated and operating in the building attacked by the fire. If the occupants, thus apprised of the danger, think they can successfully cope with the fire without the assistance of the fire department, they may easily break the connection and interrupt the transmission of the predetermined signal. Should the firemen have started, however, they will be notified on the way. For this purpose it is only needful to provide the engines or trucks with a receiver such as is employed by Marconi and attached to the war automobiles. The whole thing is feasible because such vehicles easily lend themselves to other uses.

PUSH OR PULL.

Editor Popular Mechanics:—Please give the definition of "push" and "pull" to decide a controversy. Does the horse pull or push the wagon? Do we pull our clothes or push them on? Do we pull a tooth or is it shoved out? Does a belt pull or push a pulley?

Answer:—To "push" is to press against with force; to drive or urge forward: opposed to draw. The horse pushes against his harness but pulls the wagon; we pull our clothes on; the dentist tries to pull a tooth and generally succeeds. The belt "pulls" on the pulley, the slack lead of the belt being the one moving away from the engine and towards the pulley.

Sir Richard Cartwright has given notice in the Canadian parliament of a resolution to make provision for a subsidy not exceeding $133,333 a year for a steamship service between Canada and France.

Crossing the Continent in Automobiles

The Meeting With Old Pacific Outside of Denver

Treacherous Sands Near Thompson, Utah

Crossing the continent in automobiles is ceasing to be regarded as a remarkable feat. Since the first trip from San Francisco a short time ago others have been made and several more have been planned. A Packard automobile and a Winton have already made the journey and an Oldsmobile is now on the way from Pasadena, Cal., to New York. The trip in the Packard was made by E. T. Fetch and M. C. Krarup in their car, named the "Pacific." Some remarkable conditions were experienced on this trip that will be of aid to future expeditions of the kind. In Carson Valley a most treacherous and obstructive sand bed was encountered. The road here is twisted around the mountain side so as to measure six miles in length in a distance which, in a horizontal plane, would measure less than two miles. The road, in many places, pitched as steep as 17 per cent. The road was so deep in sand that rubber tires were often completely submerged and steering was exceedingly insecure.

Then there was a terrible swamp at Spanish Point, Utah, and a "flume" that made the tourists often fear that their vehicle would be swallowed up by the deceptive earth on which they journeyed. At Soldiers' Canon, Utah, Messrs. Fetch and Karup halted and debated a long time as to whether it was possible to continue their peregrinations. This spot seemed absolutely impassable for a time. Huge walls of rock stood in defiance on every side and there were bogs and streams and thickets that made the autoists think they had certainly strolled beyond the domains of human aggression. An indefatigable perseverance and determination, however, successfully steered them from out this unearthly region and they proceeded on their trip as usual.

An Almost Impassable Spot at Soldier's Canon

Fording a Flume at Spanish Fork, Utah

The Automobile Review, discussing transcontinental automobile trip, says: "The

Pulling Out of the Swamp at Spanish Fork

Soldier's Canon—A Perilous Road

great feat of crossing the Continent in an automobile, will in a short time be a thing of the past and the trip is destined to become a summer outing for the enthusiastic automobilists."

It is likely, however, from Popular Mechanics observation, that a person is not over-anxious for more than one transcontinental automobile trip in an ordinary lifetime.

Splendid City of Tents

Oddest Town in the World is in California--No Work, All Play

A city where the houses are all of tents inhabited by pretty women and handsome men, is one of the many attractions California has to offer. The pretty women dress in the latest style and in their tent homes may be found pianos, paintings, and fine bric-a-brac. Street cars pass to and fro in front of their doors; there are stores where every table delicacy may be obtained; splendid hotel facilities, amusements galore, and altogether this tent city in California is quite a metropolitan affair, unlike any other city in the world.

Tent City, Cal.

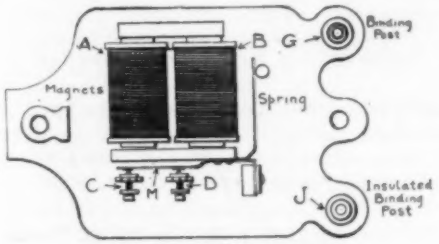
The tent city is on Coronado Beach and is cooled by the sea breezes that course across the waters from China and Japan. The inhabitants of the tent city never work. Life there is one round of gaiety, idleness and

recreation. The pretty women go bathing in the surf with and without their escorts; there is dancing in a public pavilion; boating on the bay and ocean; fishing everywhere; nightly concerts on the seashore; riding in winged vehicles that sail on land and more amusements than the ordinary person sees in a lifetime all crowded into one outing. The illustration shows the southeastern end of the city, with the grand dancing pavilion and concert hall in the distance.

HOW TO MAKE A VIBRATOR FOR AN INDUCTION COIL.

Editor Popular Mechanics:—Recently I noticed in your magazine an electrical experiment, headed, "How to Make a Large Induction Coil;" as I already had an induction coil which I bought, I did not make one.

All I needed was a vibrator, which I made as follows: I procured an electric bell and



Vibrator for Induction Coil

fitted it up, as shown in the drawing. D is an extra post similar to C, fastened in the same manner. Connect C to the end of magnet at A, then connect B, the other end of the magnet, to the post D. Connect the post D to the binding post J. The posts, C, D and J must be carefully insulated; if not a short circuit will result. The screw in post D should not touch the core spring M, when the bell is at rest. but should be screwed up to about 1-12 inch from contact, so that the vibration will strike it. It is very easily made, as I made mine in about half an hour.

ALBERT VAN BOETTER,
5636 Wabash Ave., Chicago.

The fire loss in the United States is greater than that of any other country in the world. Last year it was $161,488,000.

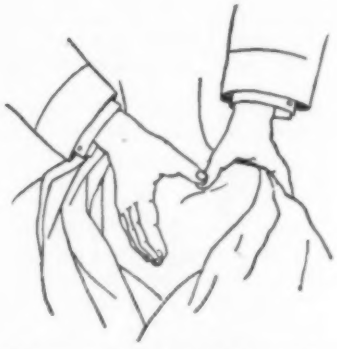
There were 7,300,000 pounds of aluminum made in this country last year.

WHAT TO DO IN CASE OF ACCIDENT.

Many a life has been saved because some one present at an accident had read a few simple hints and knew what to do. In that interesting work, "The Living Temple," Dr. Kellogg tells what to do for fainting or hemorrhage, from which we condense the following:

Fainting.—When a person faints it is because of weakness of the heart; this may

COMPRESSING ARTERIES OF THE WRIST.



COMPRESSING THE ARTERY OF THE ARM IN THE NECK.

be due to various causes. A person generally begins to feel "faint" a short time before he loses consciousness. If at this time he will immediately lie down, or if he is sitting, bend forward until his head is at or below the level of the knees, the symptoms will generally disappear within a few seconds, or a minute or two at the most. A sip of cold water or bathing the face with cold water will also generally prevent a threatened fainting.

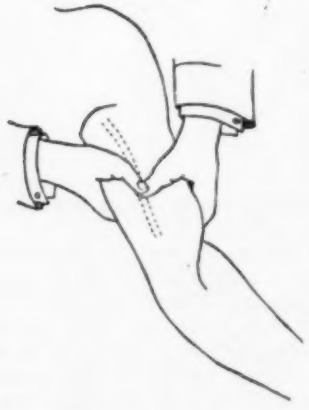
If the person has actually fainted away, he should quickly be placed in a horizontal position, laying the head as low as possible. While cold water is being brought, slap the face with the hand quite vigorously over

the face, or by wetting the end of a towel and slapping the face with it. A fainting person is in a very dangerous condition, and should be relieved as quickly as possible. In serious cases the person who has fainted must be kept in a horizontal position for some time. The tendency to faint may be overcome by the daily cold bath.

Hemorrhage.—The blood spurts from a wounded artery. The blood flows in a steady stream from a wounded vein. Venous blood is also darker in color than arterial blood. To stop the flow of blood from a wounded artery, pressure should be made on the side of the wound toward the heart. It is not always best to make the pressure directly upon the wound, but rather at some point above the wound where the arterial trunk comes near the surface, and can be pinched or pressed against the bone.

Hemorrhage of the Nose.—Reaching both hands high over head, bathing the face with very hot water, placing bits of ice in the nostrils, rubbing ice on the back of the neck, and compressing the nose frequently between the thumb and finger for several minutes, are useful measures in checking nasal hemorrhage. Care should be taken to hold the head erect. Bathing the face with cold water while bending the head forward over a wash basin often increases the bleeding.

Hemorrhage of lungs is a very serious



Compressing Main Artery of the Arm.

and sometimes a fatal accident. Bleeding from the lungs, however, is not so dangerous as is supposed, as it is very seldom that the bleeding continues long enough to produce fatal results. When the patient becomes faint, the heart's action decreases to such a degree that the bleeding ceases in most cases. Ice to the front of the chest,

Compressing the Main Artery of the Leg.

short, very hot fomentations to the back of the chest, hot to the feet and legs, and ice in the hands, are the most effective means of checking hemorrhage from the lungs.

CROSSED ARCTIC CIRCLE IN AUTOMOBILE.

Mr. and Mrs. Charles J. Glidden, of the Massachusetts Automobile club, are the first persons to cross the Arctic Circle in an automobile. According to advices received from Sweden they have successfully accomplished the feat by means of relays of peasants, which with supplies of gasoline were sent ahead as it was impossible to secure fuel from villagers for a considerable portion of the way.

A conning tower for trainmen is a recent invention. It is made of steel, and when placed on tenders and in express cars affords safe retreat when a train is held up.

On a little road in Iowa, known as the Tabor and Northen, heavy railway coaches have been hauled by gasoline motors, which the company expects to substitute for locomotives.

Great Salt Lake Drying Up

Cruise of Scientists Over the Mysterious Waters Results in Many Strange Revelations

Great Salt Lake, America's Dead Sea, is drying up. The cause is attributed to irrigation. A recent day's cruise of a party of scientists on the lake resulted in the discovery of several pecularities which, if known to exist, have at least never been recorded before.

Soundings at frequent intervals showed that the water in parts where it is deepest is comparatively very shallow. Along the coast for a distance of more than a mile from water line the bottom was found to be covered with the water too shallow to float a launch drawing only twenty-two inches. Wide stretches of new beach left high and dry by the recession of the water during the present year were found along the west coast of Antelope island.

Efforts to locate some of the fresh water springs that some have claimed feed the great lake were unavailing. Unmistakable evidences were found showing that the water is now going down at a more rapid rate than it ever has before.

Along the entire coast of Antelope at a distance of about three miles out, the water maintains a uniform depth of twenty-three feet. The bottom apparently rises very abruptly toward the island, and the launch was unable to go nearer the west coast than half a mile.

Owing to lack of time, the party was unable to follow the big submerged valley further than the north point of Antelope island, but Captain Davis, who has made soundings further, states that the water grows gradually shallower until the Bear River bay is reached, where it is but sixteen feet. The coast water was found to be so shallow that it is estimated that a fall of three feet in the level would expose many square miles of new beach.

In the vicinity of Salt bay, on the west coast of Antelope island, temperature tests showed that there were stretches of water much warmer than the surrounding waters. This water was 78 degrees, while the other was from 2 to 4 degrees colder.

An examination of the beach at Salt bay showed that a stretch of beach more than fifty feet wide has been exposed this year. Deposits of fungus growths on the beach show where the water stood before it began to go down.

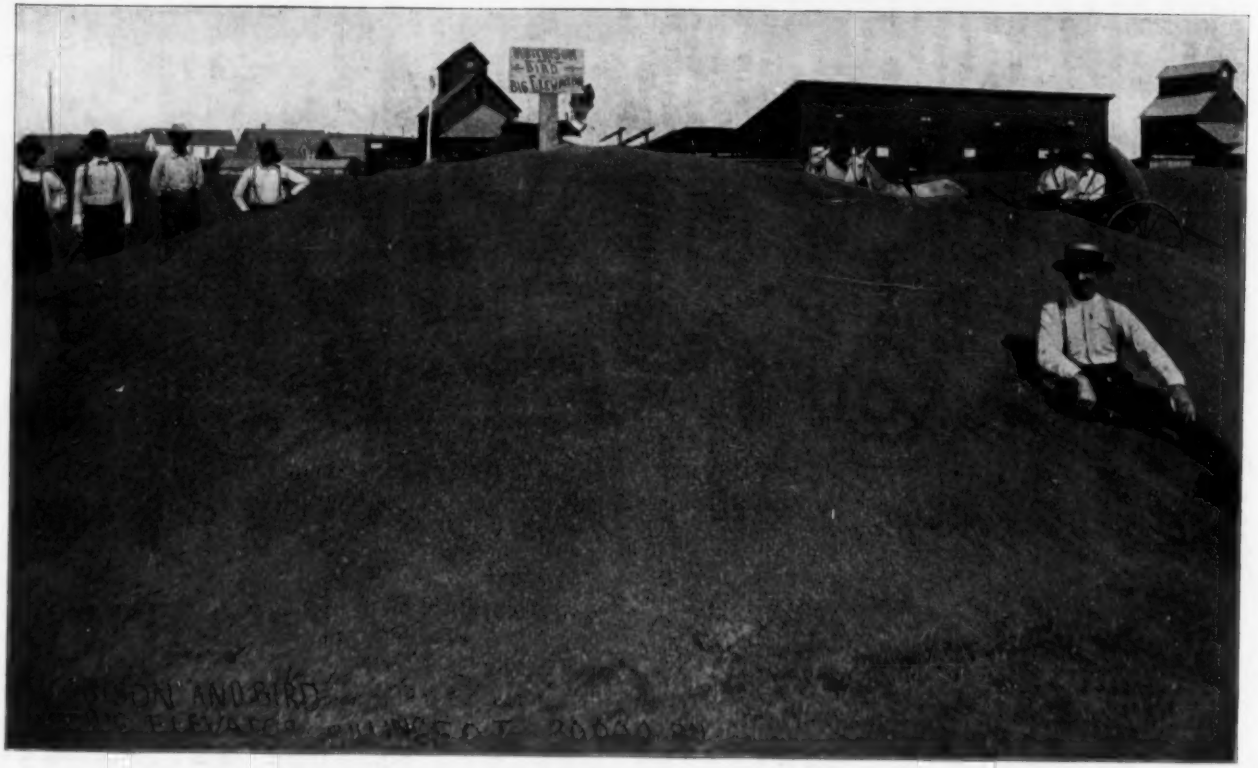
This, compared with the distance between the beach lines of former years, which remain perfectly plain on the barren coast of the island, shows that it is almost double that of any previous year since 1895. More recent marks on the beach indicate that in the past two weeks there has been a fall of about three inches.

The cruise also resulted in bringing to light the fact that the lake has its trade winds, just as the oceans have. A series of observations by Captain Davis has established the fact that over the south portion of the lake the wind blows from the north in the day time and reverses its direction at night. Thus it seems that the winds blow in directly opposite directions from the center of the lake both day and night. Evidences were found which are taken as proof that in the great lake there are currents flowing about much in the same manner as the warm currents in the oceans. Temperature tests showed that the water in various places is not uniform warmth, and this is taken as the cause for the lake currents.

WELDING OF METALS TO FORM PLATED METAL.

A German process relates to the welding of metals to form plated metal. The surface of each of the metallic bodies to be welded is cleaned, and aluminum applied by rubbing the surface with brushes or rollers of aluminum wire or sheets, or with solid aluminum, either by hand or by suitable machinery. The two prepared surfaces are then placed together, with a thin sheet of aluminum between them, and heated and pressed together to form a weld. The thin coating of aluminum prevents oxidation of the plates during heating, and prevents the entry of aluminum from the sheet into the bodies. If the metal to be welded is aluminum, the thin coating is, of course, dispensed with. In forming plated metal sheets, thick sheets or ingots are welded together, then rolled down. Plated wire may be formed by placing a thick body in a similar manner, and drawing it down to the desired size.

Great Hazards Made Necessary by Car Famine in Oklahoma



30,000 Bushels of Wheat on the Ground at Billings, O. T.

OPEN AIR GRAIN WAREHOUSES.

Remarkable Conditions Existing in Oklahoma Because of the Car Shortage.

The elevators are full of grain; the bins are filled to overflowing; every place that grain can be stored is overstocked; there are not enough cars to carry it away; the only place left to store the fastly incoming wheat is on the open ground with only the canopy of heaven as a protection; this often leaks disastrously. Should a rain occur it would inflict awful loss and there would be splendid grounds for a big damage suit against the railroads for not providing facilities for transporting freight as required by their charters.

Such is the unprecedented conditions in Oklahoma brought about by the disastrous shortage in cars. The illustration herewith shown is at Billings, O. T. They were compelled to resort to the remarkable extremity in order to remain in the market for grain. This picture is only one of many to be found in Oklahoma.

The Grain Dealers' Journal says: "The piles of wheat stored in the open air, by Hutchinson & Bird, occupy a space of 480 feet long and 40 feet wide, and contain approximately 30,000 bushels of hard and soft wheat. Surely grain dealers must be in desperate straits when they will take such great chances to remain in business."

The past season has been the most unprofitable in years for the sailing craft of the Great Lakes.

The street car system of St. Petersburg will soon be changed from animal power to overhead trolley.

LARGEST CAR IN THE WORLD.

Weighs 100 Tons—Is 103 Feet Long—Will Carry a Load of 150 Tons.

The largest car ever built has been constructed at the Bethlehem Steel Works for shipping its big castings. It is 103 feet long, 10 feet high and 9 feet wide. It consists of two trucks, each running on 16 large wheels, and bearing a steel truss platform capable of carrying 300,000 pounds. The car itself weighs 196,420 pounds. The load shown in the picture is one of the big castings for a 12,000-ton forging press for the Carnegie Steel Co., weighing 220,330 pounds. The purpose of the long truss and numerous wheels is to so distribute the enormous weight as to safely pass over tracks and bridges.

Largest Freight Car Ever Built

STEEL RADIATORS.

The London Mechanical Review says: "Radiators are now made of pressed steel and they are said to have many advantages. In the first place, because of their exceeding lightness, they are much easier to handle than those of cast iron and the saving in the matter of freight charges is considerable. When set up they are almost instantly available for heating as the metal is so thin that the heat is transmitted at once. In the manufacture of this radiator, each section is made of two sheets of steel which are pressed, punched and sheared into shape separately. The two halves are brazed together while being held in a clamp and this joint has, it is said, withstood a pressure of 100 pounds to the square inch. Truss rods are used to hold the parts together

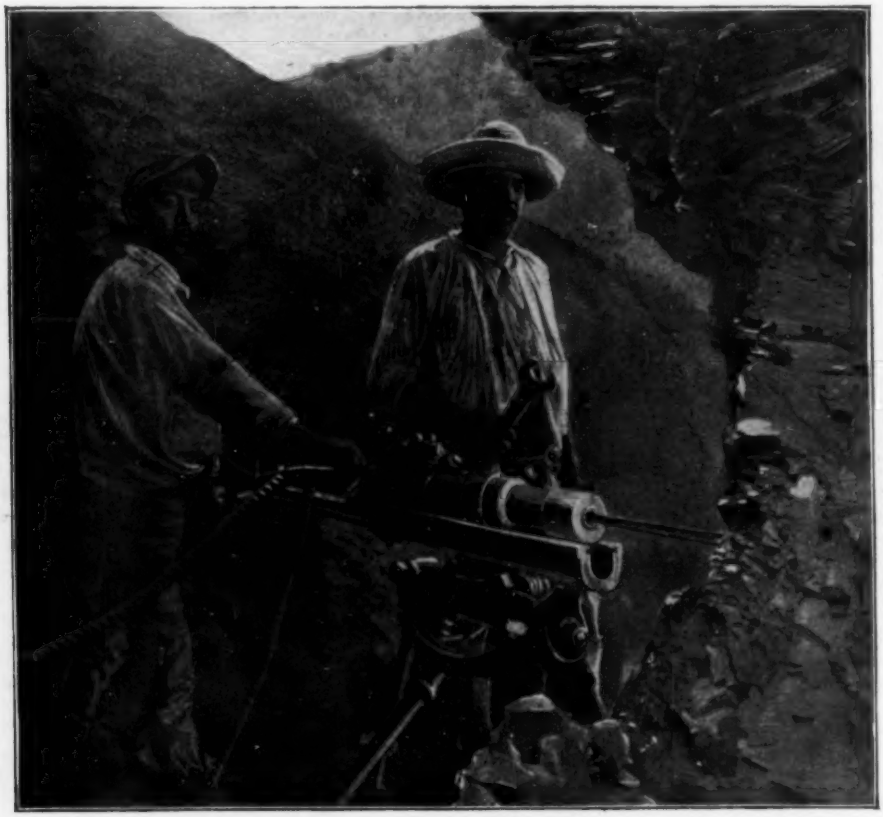
American Rock Drills Win Victory

In Contests in Japan and Mexico They Prove Themselves Superior to All Other Foreign Makes

In recent competitive tests of rock drills, manufactured by different nations, America won first honors over all competitors. The German and English drills could not make half the speed of the American. From Denver, the metropolis of the Rockies, were brought machines that amazed the foreign manufacturers by their speed and skillful workmanship. The tests in Japan resulted in the exclusion of all other makes from the Ashio copper mines of that country. In Mexico a similar competition occurred, and as a result the American drill holds supreme sway in that country.

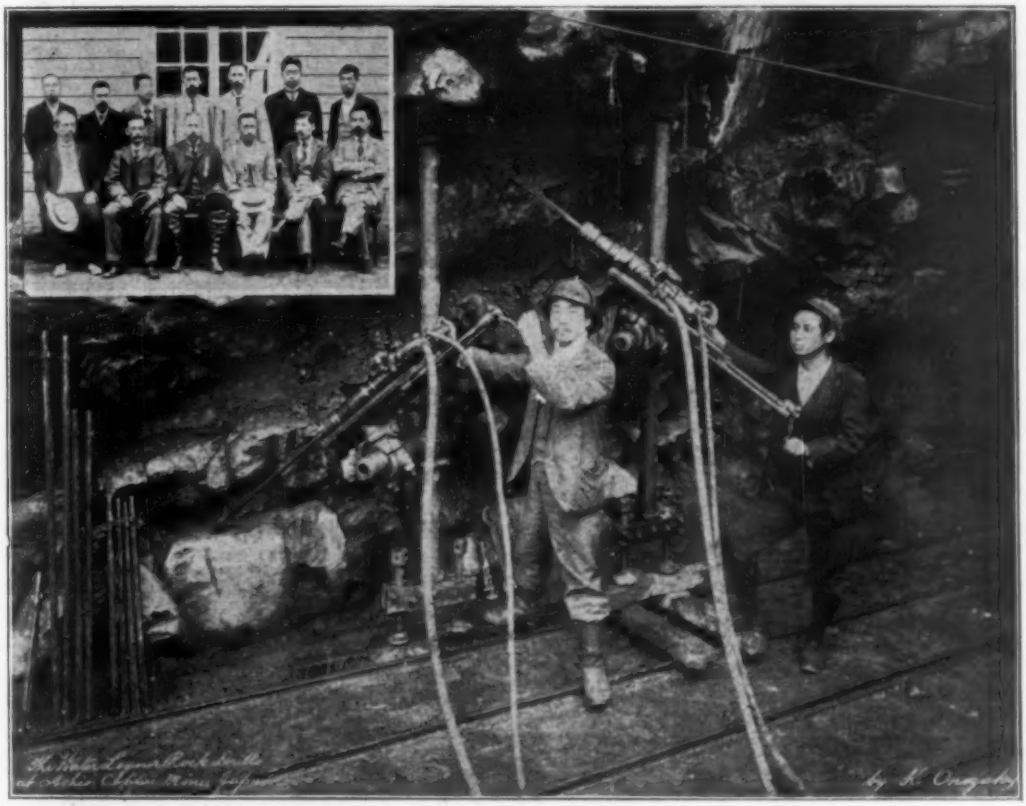
The competitions came about accidentally, as a result of men from different nations being interested in different mines in the countries referred to. Each thinking his nation made the best drill, had the machines imported from his home. The ones that came from America so far outclassed the others that the patriotism of the other promoters was considerably dampened, and they, too, have gone to using the American makes.

The drills that won the victories were operated by compressed air, and were entirely different from those brought from other nations. The piston and tool of each were entirely disconnected. The tool was driven into, not plunged against the rock. The cuttings were forced from the hole, not by the impact of the tool, but by compressed air and water (water under pressure) dis-



An American Drill Operating in the Republic of Mexico

charged through the tool or drill steel. They required but one-half as much air as was required to operate other air drills having the same diameter of cylinder and built for the same class of work. They weighed but little more than half as much as the foreign types, and were much more quickly set up, taken down and moved about. They were capable of easily crossing slips and seams, talc streaks, etc., without "fitchering," without getting "hung up" and without losing holes, and also were capable of drilling back holes much faster than they could be drilled by the other machines.



Water Leyner Drills in Ashio Copper Mines in Japan

If all the power going over Niagara Falls were utilized it would give 6,000,000 horsepower.

The longest submarine telephone cable in the world is 245 miles in length. It is a part of the line between London and Brussels, and was completed June 8, 1903.

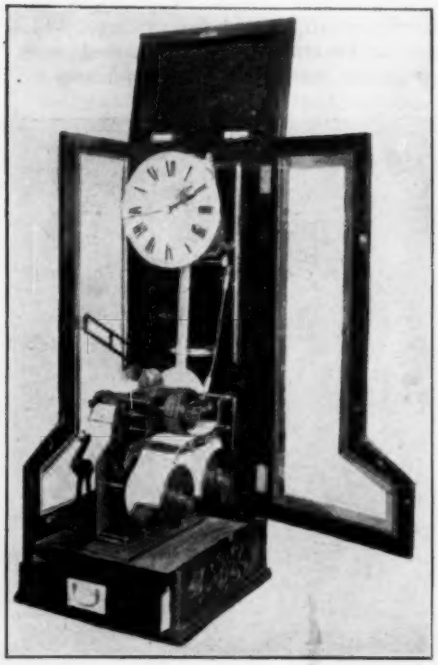
METHOD OF TRANSFERRING PICTURES.

Pictures may be transferred to painted surfaces in the following manner, says the New England Architect: Cover the ground with an even coat of light colored carriage varnish, which should be allowed to set (nearly as dry as if for gilding). If the print to be transferred be colored, soak it in salt and water; if not colored, use water alone. Remove superfluous water by pressing between blotting pads, and then place the picture face down upon the varnish, pressing it smooth. When the varnish is dry, dampen the paper, and rub it off with the finger. The picture will be found upon the varnish, and another coat of the latter should be added to bring out the effect. This process answers equally well for glass or metal surface.

SUBSCRIBE FOR POPULAR MECHANICS

INSURANCE BY SLOT MACHINE.

The craze for slot machines in London, where nearly all the wants of the people are being supplied by these automatic tradesmen, has led to a most ingenious conception



Mechanical Accident Insurance

in the form of an automatic insurance machine. The device defies fraud and has the appearance of a clock. When the applicant drops his penny into the slot, he pulls forward a handle, when out drops a pencil, ready sharpened, and an opening is disclosed through which the signature is made. Then the applicant pushes back the handle, and simultaneously the space closes and an insurance policy is issued through another slot. Against the signature inside the machine is printed the exact date and time, to the minute, at which the policy was issued. If the insured meets with an accident in seven days, he applies to the Industrial Accident Insurance Company for his weekly allowance; and if his name is on the register retained by the machine, the policy is paid.

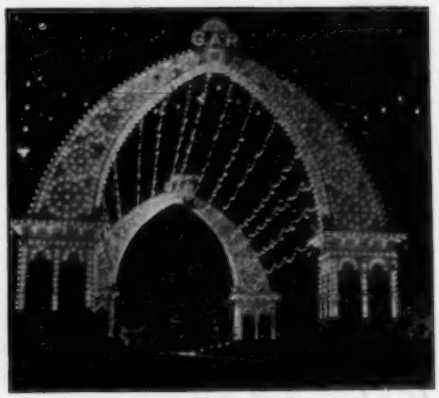
Electric cars and automobiles in Germany are not allowed to exceed 7 miles an hour in towns, and 15 miles in the suburbs. The penalty is a fine of $15 or 14 days in jail.

SELIUM: AN ALLEGED NEW METAL.

German papers, says Consul General Guenther of Frankfort, report the discovery by Edward Mollard, a Frenchman, of a new metal called "selium." According to the English Mechanic, the discoverer claims that selium costs but one-twelfth as much as aluminum, and is lighter and stronger. It does not rust, and is therefore suitable for use in shipbuilding, for the manufacture of pipes, and for railroad construction. On account of its cheapness, and as it is capable of a fine polish, resembling nickel, it would be desirable for manufacturing cooking utensils. Its density is 2.6 and its hardness not quite that of iron, but greater than that of lead or zinc. Its power of resistance is said to be greater than that of iron, but less than that of steel. The melting point is at 1600 degrees C. (2912 degrees F.). In melting it contracts somewhat, but molding in forms is not impossible. It will be well, however, to await more definite information concerning its properties.

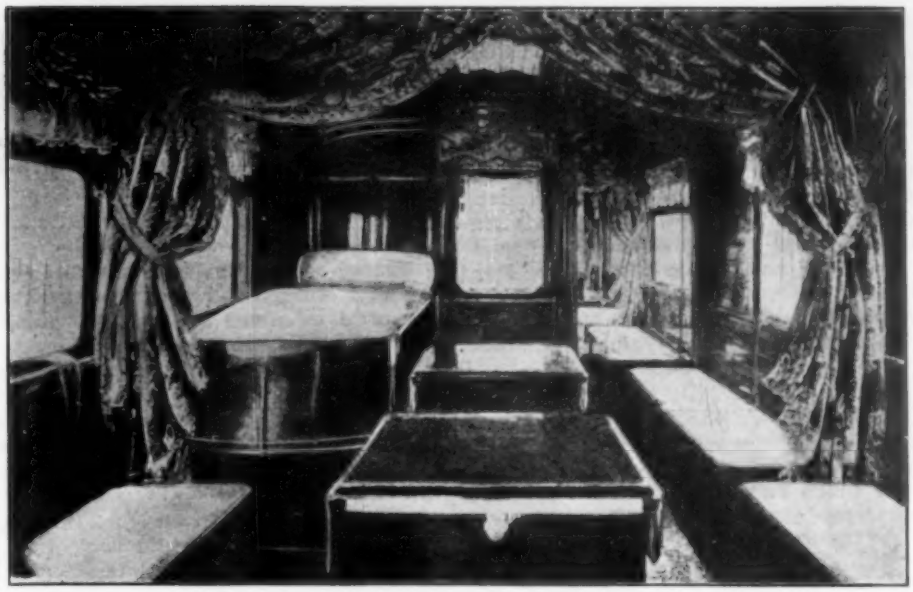
GRAND ELECTRIC ARCHES FOR G. A. R.

Two grand electric triumphal arches each 100 feet wide at the base and 75 feet high, were built in honor of the G. A. R. by the patriotic citizens of San Francisco. Twenty thousand electric lights blazed out from the arches in honor of the war veterans who



Splendid Electric Arch at San Francisco During G. A. R. Parade

marched beneath. Between the arches, which were placed 200 feet apart, great cables of lights glowed and swung gracefully in mid air, while other cords of light were draped to all the surrounding buildings. The effect was to transform Market street into a midnight fairy land.



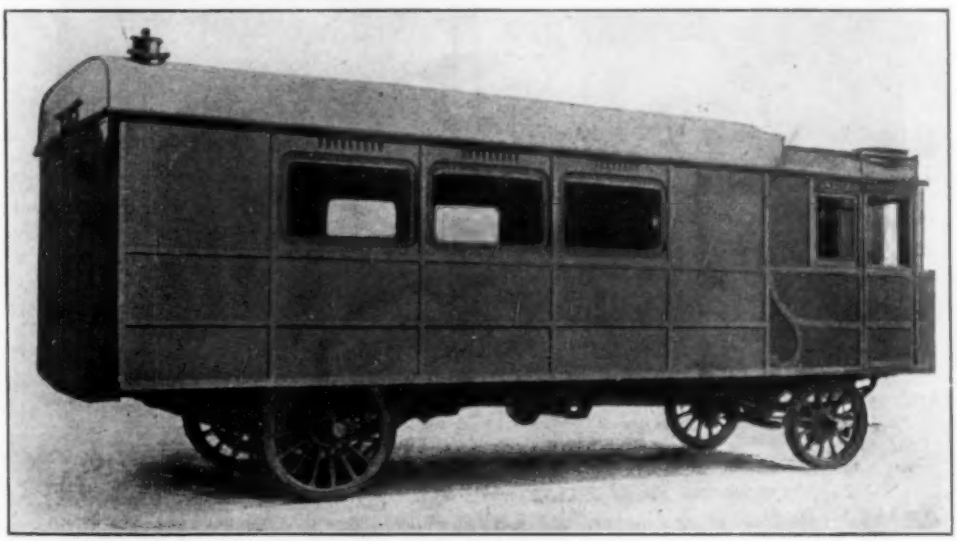
Interior View of House Car Showing Bed, Bunks, Tables and Seats

Automobile House Car The Latest

In This Novel Conveyance One May Live in Comfort and Tour the World

The automobile house has come; in it one may ride, eat, sleep, and entertain his friends by speeding over the country at 60 miles an hour. What the sleeping and dining car is on steam railroads the automobile house, "Motor caravan," is to automobile travel.

This unique and costly conveyance is the property of M. Jules, Secretary of the Bordeaux Automobile Club, and is the most ex-



The House Car—Twenty Feet Long

pensive automobile ever constructed. The car is nearly 20 feet long, 9 feet wide, and nearly 7 feet high, and with its supplies and five passengers on board weighs four tons.

The forward compartment contains the machinery, placed in an observation room; here also is a folding bunk for the operator. The front and sides are fitted with plate glass windows. The middle compartment is the living and dining room, with four berths which close up during the day to form cushioned seats. In the center of the room are two tables. At night this compartment is divided into two rooms by a heavy curtain. When the tops of the two tables are raised commodious wash stands with running water, hot and cold, are revealed. The tables will accommodate eight people. To the rear is a third compartment where the cook lives and works. Here is found a gasoline cooking range, ice box, china closet, wine closet, etc.

Instead of the usual air tires the wheels are very strong, with wide steel tires, and the car is mounted on springs making it ride as smoothly as a carriage.

CARLOAD OF RARE LIVESTOCK.

The Railway Conductor says: "There was a Union Pacific car loaded with livestock from Angel City, the destination of which was unknown and the billing lost. We dare say, however, that plenty of conductors can be found who would feed and take care of the 'stock' all the way to destination."

The car was well loaded and the stock was rare quality, western breed.

The above picture shows a U. P. car loaded with "live stock" from Angel City Div. 84, L. A. to O. R. C. Destination unknown; billing lost. We dare say, however, that plenty of conductors can be found who would feed and take care of the "stock" all the way to destination.

TREATMENT OF LEAKS IN CONCRETE WITH OIL.

From the report of the Chief of Engineers, U. S. Army, 1902, it is learned that in the fortification work at Fort Caswell, N. C., it was found almost impossible, with the unstable subsoil, to prevent unequal settlement and consequent cracking of concrete. It was noticed that water falling on the concrete surfaces near the guns, which had been coated with the oil used on the guns, was not absorbed, and this led to a coating of the entire concrete mass with boiled linseed oil. Where large breaks occur, they are filled with cement grout, and the linseed oil is poured in as long as it is absorbed. There is formed in the crevice a gum from the oil which in time fills it to the top, after which the entire surface is coated with successive applications of the oil until it ceases to be absorbed. Previous to the trial of this method the two 12-inch emplacements were noticeably leaky, and for the purpose of experiment the worst of the two was selected and treated as above outlined, with the result that it was made perfectly water-tight. Since then all of the emplacements of the post have been treated in a similar manner, and may now be considered water-tight. It is thought probable that it will be necessary to give a coating of oil, at least near the openings, when the concrete expands and contracts in the spring and autumn, but this will be comparatively inexpensive and take very little time.

GASOLINE FREIGHTER ON LAKES.

Twofold interest attaches to a vessel built in Chicago and recently sent on its first trip across Lake Michigan. The boat is the Grace J., the smallest freighter on the lakes and the first gasoline freightship ever given attention by the United States inspectors at Chicago. She is believed to be the only freighter of her kind entered on the lists of the United States inspection service.

Built to enter the fruit trade between Chicago and Michigan ports, the Grace J. is made as roomy in the hold as her fifty feet length and fourteen feet beam will permit. On a safe draught the boat will carry twenty-five tons of freight.

Sever Johnson, builder and owner, had charge of her thirty horse power engine when she puffed out of the Chicago river, bound for Manistee. Johnson believes the engine will drive his vessel nine miles an hour and that the boat will stand much heavy weather. Tanks in the forward end of the boat will hold 100 gallons of gasoline, enough to supply power for twenty hours.

HOW STRAWBOARD FACTORIES KILL FISH.

A strawboard factory in Indiana has depopulated the fish in the White river. Thousands of dead and dying fish were seen recently decomposing in the hot sun. All kinds and sizes of fish were seen. The health board has taken the matter in hand and the fish have been taken away by a fertilizing manufacturer. The officers examined the dying fish and found that a sediment of a gluey consistency had practically closed the gills. It is the sediment from the strawboard mill and not poison. The sediment floats in the water and is taken up by the gills of the fish. There is no escape, and in a short time the finny inhabitants of the river die of strangulation, not poison. It is the minute particles of straw fibre that do the work.

THE OVERWORKED MONUMENT.

She followed him unto his grave,
And reared a marble rare,
And chisled on this sentence sweet:
"My grief I cannot bear."

She mourned a year and then was wed,
And they chisled on that stone
A single word, and now it reads:
"My grief I cannot bear—alone."

But soon she wore her weeds again,
And they turned that stone about,
And on it traced this touching line,
"My life's light has gone out."

Not long she walked in darkness lone
Around that marble patch,
The bells rang out, the sculptor wrote,
"I've struck another match."

She's happy now with number four,
But all the neighbors say,
That she will be a busy girl
On Resurrection Day.

The congress of the chambers of commerce of the British empire adopted resolutions urging the establishment of fast steamship lines between England and her colonies.

Automobile Potato Digger

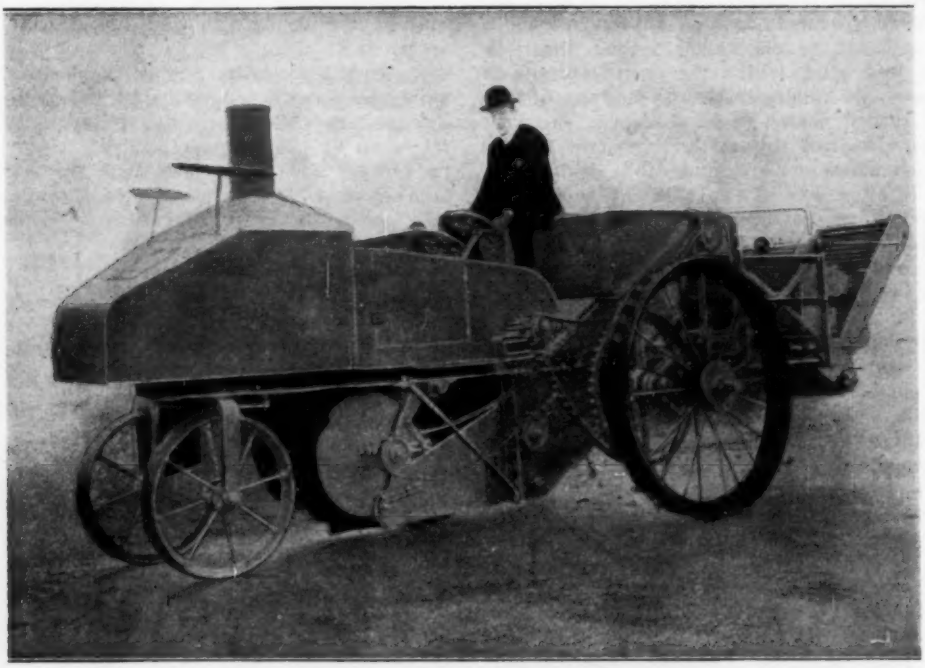
Unearths Whole Row of Tubers Bodily and Lifts Them Into a Cart Ready for Market

An automobile potato digger that gathers up every potato in the row as it moves, sifts out the dirt, and places them in baskets ready for the market, has made its appearance in England and foretells a new era of potato culture.

The London Implement and Machinery Review says:

"This machine is designed to dig, gather and deliver potatoes either into baskets or (if fitted with the firm's 'cart elevator') direct into a cart at one operation. The lifting-share is so set that it will lift a row of potatoes bodily, the loose earth escapes through an open grating, and the tubers are then carried to an inclined elevator, which conveys the potatoes to the riddles, from whence they fall through a large hopper into baskets behind, unless it is desired to cart them direct."

The Farm Implement News says: "The machine attracted much attention at the show of the Royal Agricultural Society. It is known as Moulton's self-moving potato harvester. The necessary propelling power is derived from a 20-horse-power semi-rotary engine, a remarkably simple and economical motor which attracted a large amount of interest. Coke, coal or any other kind of fuel may be used, the steam being generated in an improved flash boiler of very simple and safe construction."



English Machine that Digs, Gathers and Delivers Potatoes

U. S. Navy Buys German Wireless Telegraphy

Uncle Sam has gone to Germany for his new wireless telegraphs which will be installed on eight new battleships. The system selected is the Slaby-Arco, which is a German invention, and will be adopted by our government as best suited to naval work. Satisfactory terms could not be made with Marconi.

Finished Buildings at the World's Fair

They Presage the Grandeur The Exposition is to Impart When Completed

Buildings of the St. Louis World's Fair that have been completed give an idea of the degree of magnificence the big show will present when it opens May 30 next.

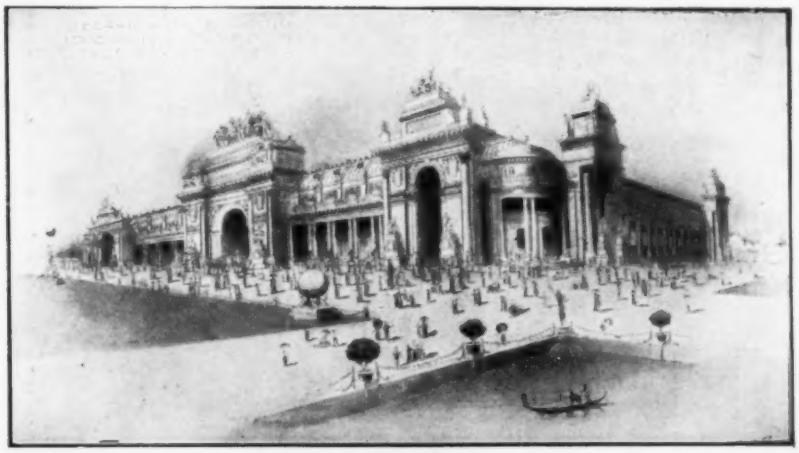
Varied Industries Building

Varied Industries Building, which has just had the last finishing touches administered, is truly a magnificent structure. It is to be the first thing to meet the visitor's view after passing the main entrance. It presents a facade of 1,200 feet on the north and 525 feet on the east, covering 14½ acres of ground. On the main facade is a center tower 400 feet high, with flanking towers each 200 feet high. The contract for this building was the first to be let.

Contractor H. W. Schlueter, of Chicago,

Transportation Building

spent nearly $11,000 for hoisting machinery in building the Transportation Building before a particle of the building was erected. He employed methods used in building the Chicago World's Fair and is said to have installed the most powerful hoisting plant ever used in putting up an exposition building. Four stiff-leg derricks worked side by side the whole width of the building, equipped with a 40-foot mast and 70-foot boom, and a 20-horsepower hoisting engine.



Liberal Arts Building

The Transportation Building will be the largest building at the St. Louis World's Fair excepting the Agricultural Building. It covers more than 15½ acres, while the Agricultural Building will cover 18 2-5 acres. The Transportation Building contains four miles of standard gage railroad track. Sixteen groups of statuary at the base of the main piers illustrate transportation in all its phases as well as the progress made by the United States in the science.

The Liberal Arts palace is another of the latest structures to reach completion. This structure covers more than nine acres and cost half a million dollars. The building was constructed without interior columns, the exhibit space being spanned in one truss. The internal court can, if necessary, be used as an overflow exhibit space.

AUTOBUS LINE IN JAPAN.

Japan has one electric railway at Tokyo, the capital, and is looking with great favor on the automobile as a public conveyance. Already a line has been put in operation between Nagoya and Atsuta, two important cities, 10 miles apart.

DEVICE FOR WASHING MOVING TRAINS.

Is the time-honored occupation of the car washer, with his hose and sponge, to be taken away? In London a method is now in use on the Great Western Railway by which an entire train is washed in a few moments by one man, and he does not get a splash.

On each side of the shed on a movable frame there are arranged brushes which are made to revolve rapidly and beside these brushes there are perforated water pipes which when the apparatus is in action, give a copious discharge of water. The whole is operated by steam power, says Railway Engineering, and the man employed in the washing of cars stands behind glass screens which keeps him from getting wet. By the manipulation of levers, the revolving brushes are brought against the sides of the coaches. There are water pipes on each side of the brushes, so that if by any chance the brushes should leave streaky patches the "Niagara" flow washes it off.

The brushes are on shafts driven by chain gear and sprocket wheels, so that water has no effect upon them, and the track is arranged to drain the water off as rapidly as it falls. Something over a thousand coaches are thus given their "tub" every day. The train passes through the shed at four miles per hour.

If you want to earn a fine one-half horsepower gasoline engine, absolutely safe, write Popular Mechanics.

Farm Mechanics Taught in College

A Chair of Farm Mechanics has been established in the Iowa State College, in pursuance of a plan suggested some time ago by Popular Mechanics. Prof. C. J. Zintheo, a learned man of much practical experience has been chosen as the instructor. The work has been organized as a branch of the agronomy department of the division of agriculture and it is intended to cover instruction in all kinds of farm machinery and appliances, land drainage, rural telephones, farm water supply and the various means of obtaining power for operating farm machinery, such as electric motors, gasoline engines, steam engines, water power and wind power. A three-story fireproof building is being erected as a laboratory for conducting the work.

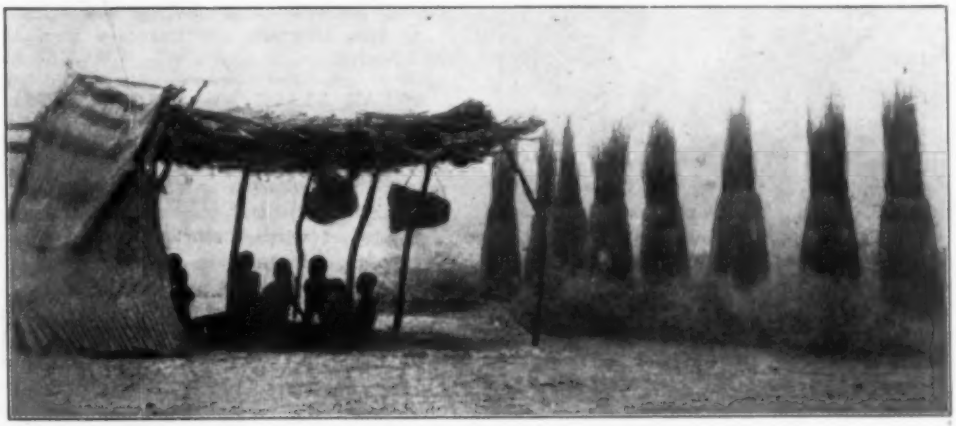
Iowa has, according to the last census, $55,000,000 invested in farm machinery, a greater amount than any other state in the union, and the annual expenditure for farm machinery and mechanical appliances used on the farm amounts to not less than $10,000,000. This expenditure might be greatly reduced by a more intelligent use and better care of the machinery.

New Metal Casting Process

The Deutsch and Hochhauser patent relates to the manufacture of iron or steel castings of increased density with residual magnetism and increased permeability, by casting the metal in a magnetic field, the direction of the lines of force being changed while the metal is in molten state to aid in expelling gases, and kept constant while the metal solidifies. The casting is arranged to complete a magnet circuit between the poles of two or more electromagnets. The increased density of the castings renders them especially useful for dynamos, armor plate, axles, etc.

Queer Foundry in Nigeria

Primitive methods of working iron discovered in the interior of Nigeria, which country is now being opened up by the British, is a revelation to many of this day. So far removed from civilization that even clothing is regarded as unnecessary these natives have a very rude appearing but effective system of casting metals. The illustration is from a photograph of a foundry discovered by the British at Touedigan in Nigeria.



Foundry in the Wilds of Africa

Nigeria is north of the Gulf of Guinea in West Africa, and has an extent of about 500,000 square miles. It extends along both sides of the Niger river and is very fertile.

TO RELIEVE THE ICE-BOUND DISCOVERY.

The auxiliary relief ship, Terra Nova, formerly a Newfoundland steam whaler, has gone to the Antarctic regions to relieve the ice-bound British exploring vessel Discovery. The Terra Nova was fitted out by the British government, acting independently of the scientific societies, which fathered the Discovery expedition. Premier Balfour in the the House of Commons criticised the action of the Royal Geographical Society and the Royal Society in sending out the Discovery expedition without being fully prepared to safeguard it.

The Terra Nova

The Terra Nova in material and design is admirably fitted to force its way through the ice. She has sailed direct for McMurdo bay, where the Discovery had then been frozen in for eleven months at the foot of Mount Erebus in south latitude 77.50, east longitude 166.42. The Morning transferred provisions to the Discovery by means of sledges over the ice.

The Terra Nova carries gun cotton which is to be used in blasting out a channel to relieve the steamer. If the Discovery cannot thus be extricated its officers and men will be transferred to the Terra Nova and the Discovery will be abandoned.

THE BATTLE WITH THE SAFE BLOWERS.

For years there has been waging a battle royal between the people who build safes and the army of experts whose business it is to crack and rob the strong boxes. In fact the competition has been on a smaller scale quite like that between the makers of armor plate, and the gunners. When the safe maker secured a steel which could not be drilled the safe cracker resorted to nitroglycerine and blew the doors open. Then the doors were made to fit more tightly, and the crackers simply took a sledge, knocked the handle off the door and used an air pump to draw in his explosive. Even the smallest crack will admit enough explosive for the purpose.

After awhile even this was guarded against, and thereupon the enterprising burglar found a new discovery and agent more powerful than ever in thermit. Machinery in a recent issue quotes W. J. Hammer, an electrical expert, who says: "I have seen steel safes in which enormous holes had been burned by employing thermit, and it would be possible for a burglar to carry some thermit in his pocket and burn a hole in a safe large enough to insert his arm and extract the valuables. I saw in Germany, last summer, a substance called 'anti-thermit' which it is intended to place in the lining of safes to prevent the reaction taking place, thus protecting the safe."

At last accounts the burglars were still up-to-date.

GREAT BLACK SEA-BALTIC CANAL.

The "Journal de St. Petersbourg," says: The Austro-Hungarian and German governments have come to a final agreement regarding the Elbe-Dniester connection scheme. This project when materialized will provide the nearest route from the Black Sea to northwestern Europe by way of the Elbe, Oder, Vistula, San and Dniester rivers, and in view of the construction of the Danube-Oder canal, will place Warsaw, Hamburg, Lubeck, Vienna and other important towns on any of the rivers mentioned and their tributaries in direct connection with the Black Sea. As the central flow of the Vistula and nearly the whole of the Dniester, with its outlet into the Black Sea, is in Russian territory, Russia will be asked to co-operate.

The Horse's Greatest Foe

Traction Engines Doing More Than All Other Influences Toward His Annihilation

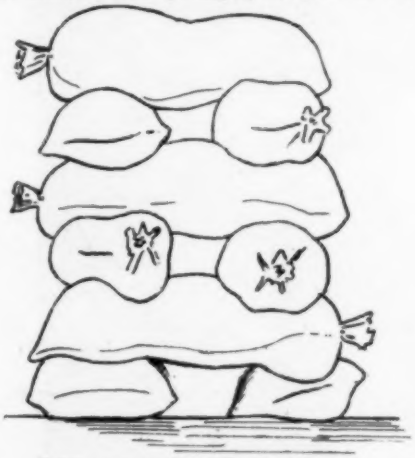
Although the steam traction engine has pervaded almost every realm of commerce its utility is nowhere more manifest than in agriculture and here it has made the greatest headway. Throughout America and even in slowgoing Europe horses have vanished from the fields to give way to the powerful tractor. Nothing has done more to drive out the horse than this machine and its influence is to be felt even more in the future from the result of new and important improvements.

Enterprise says: "The adaptability of the steam tractor is variable and comprehensive, and in its great tractive force and cheapness of operation lies its distinguishing feature as a material aid to the development of the many enterprises which were left dormant for the lack of feasible and inexpensive methods of handling the heavy freights necessary in their progression."

Traction Engine on the Farm

REMEDY FOR HEATING CORN.

A shipper in the South had a lot of corn sent him, which promptly began to heat. Unless something were done at once the entire mass would soon be ruined. Not having any machinery for correcting the trouble, he put the corn in 2 and 2½-bushel sacks and piled them up, out doors, so the air could circulate freely, as shown in the cut. The Grain Dealers' Journal says the pile was covered with canvas whenever a shower occurred, and the corn was dried out and saved.

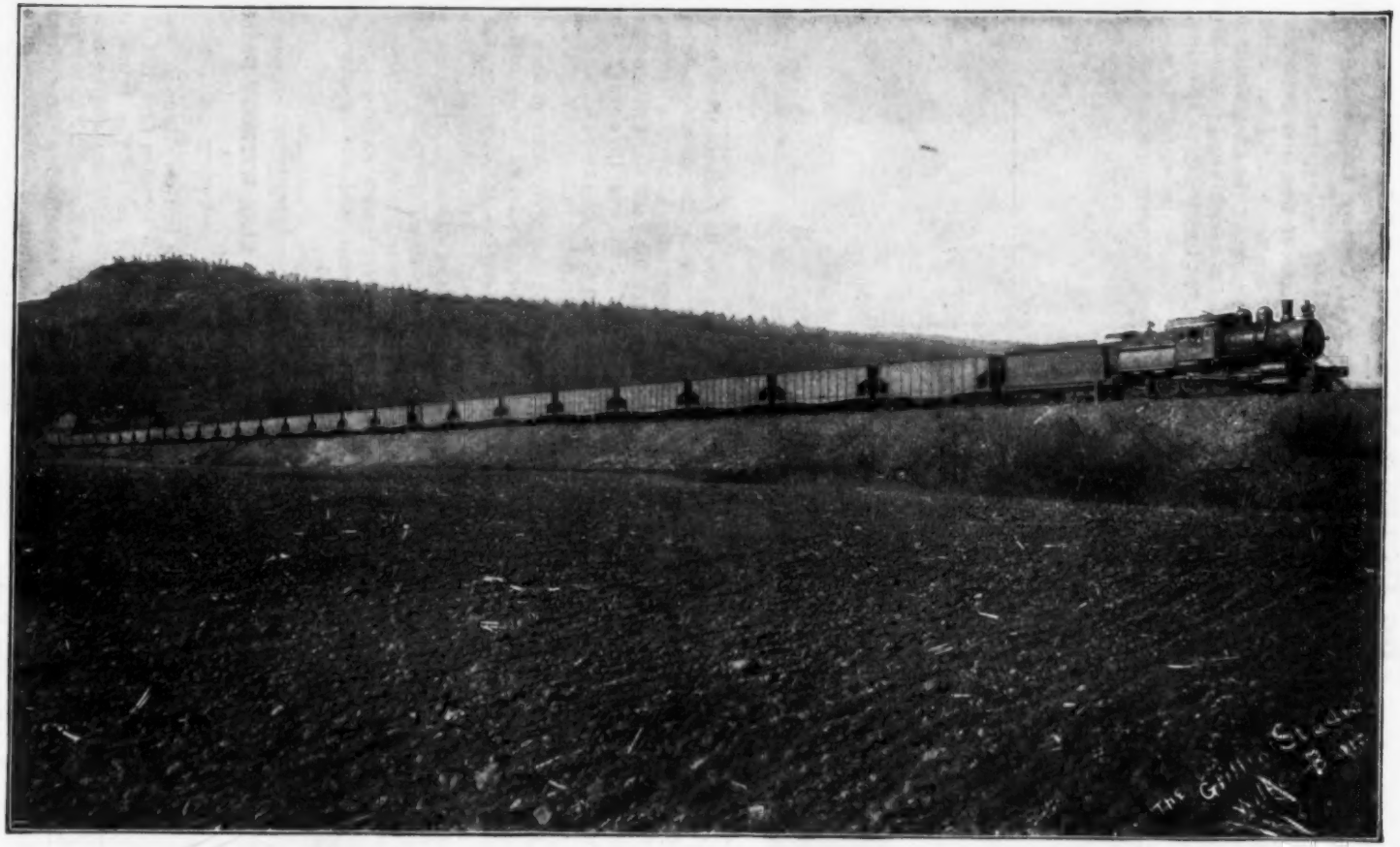


Kept Corn From Heating

ELECTRIC LINE WITHOUT RAILS.

A lime quarry in Grevenbrueck, Westphalia, operated by a Dresden firm, has an electric line without rails. The trains consist of a 50-horse-power trolley engine and cars, the whole train weighing 22 tons. The line is used for transporting lime from the quarry to the railway station, a distance of about one mile.

Twentieth Century Freight Train--All Cars of Steel



Heaviest Train Ever Hauled

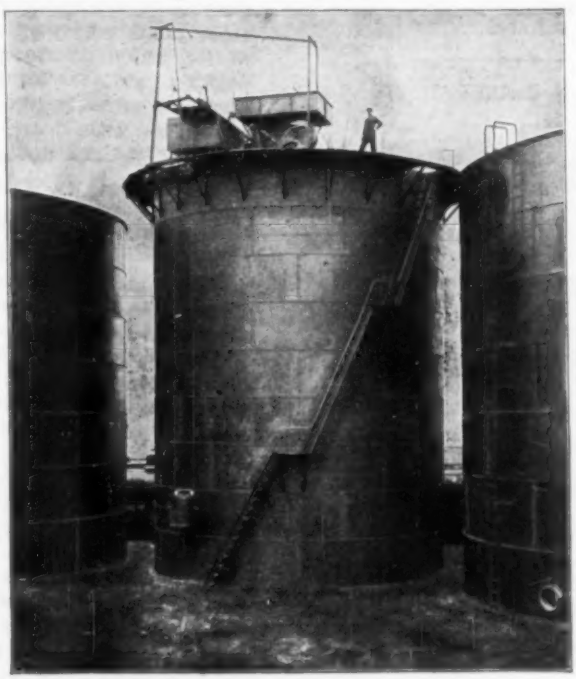
Giant Locomotive Hauls Heaviest Trains

Twenty-Seven Solid Steel Cars and Lading Weighing 1,300 Tons Pulled by a Single Engine

The heaviest train ever hauled by a single locomotive was recently pulled up the mountain grades near Wilkesbarre, Pa., by a giant Baldwin locomotive. It was a solid steel freight train of 27 cars on the Lehigh Valley, and weighing more than 1,300 tons of cars and lading, exclusive of the weight of the locomotive. On the mountain grades near Wilkesbarre, it was hauled up grades of 66 feet per mile at a speed of 17 miles per hour. This work required the development of about 1,800 horsepower continuously. The locomotive was of the Consolidation type, with Vauclain Compound cylinders, and weighed 125 tons. A number of similar locomotives are in service on the Lehigh Valley for hauling trains up the mountain grades. It is common for them to operate trains weighing 1,000 tons of cars and lading.

World's Largest Continuous Water Softening Plant

Working automatically and continuously and softening 1,440,000 gallons of hard water every day to make it ready for use in locomotives, the great water softener that has been installed on the Pittsburg and Lake Erie Railroad at McKees Rocks, Pa., is a masterly achievement in modern mechanics. Besides being the largest continuous water softening plant in the world, it is one of the most remarkable for its simple and effective operation. The plant is shown in the illustration. It is one of ten that have been built on this road. The softener is shown in the center of the picture. The two



Largest Continuous Water Softening Plant in the World—Daily Capacity 1,440,000 Gallons

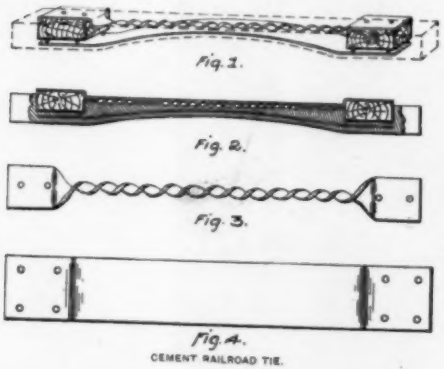
steel storage tanks on either side have a capacity of 500,000 gallons each. The system of softening water is known as the Kennicott.

The water is softened by the use of lime and soda ash, which removes the scale forming substances. The flow of hard water operates a water wheel which supplies all power needed. The machine starts and stops automatically, according to the supply of hard water. The amount of water flowing into the softener up to the maximum capacity is regulated automatically by the amount drawn out. Duplicate soda tanks overcome the necessity of shutting down while preparing a fresh supply. The lift device raises the chemicals required to the top of the machine without the necessity of manual labor. The purified or softened water flows out from the top of the machine; thus the water has sufficient head to run to a separate storage tank if desired. By inclosing the intake pipe in the body of the softener, freezing is prevented.

An automatic hoisting device is used for raising the re-agents—lime, soda ash, etc.—to the top of the softener.

CONCRETE RAILROAD TIE.

Railroad men are more and more looking forward to cement ties to solve the problem of what to use when wood has gone, or become too expensive to use. The latest



CEMENT RAILROAD TIE.

cement tie is described in The Railway Age as follows:

The tie is composed of a cement body molded around a stiffening framework, consisting of an upper twisted tiebar and a lower outwardly bowed stiffening plate. These plates are separated at the ends by wooden blocks, as shown in Figs. 1 and 2. The principal object of the block is to form a resilient support for the rail, and for this purpose they extend above the surface of the cement, so that they can wear down in use a considerable amount before the upper surface is low enough to let the rail touch the cement body. Each end of the bar is turned upward to project above the surface of the cement near one of the blocks, and a flat plate covers the top of these blocks and acts as a tie plate or bearing for the rail. These plates have holes through which spikes are driven to secure the rails to the blocks. The rails are thus securely held to gauge and are prevented from spreading. The twisting of the bar gives it a firm hold to the cement throughout its entire length. The tiebar may be large enough to permit of the flattening of its ends to form the plates over the wooden block, as shown in Fig. 3. The lower stiffening plate Fig. 4, extends under each of the blocks and has upwardly projecting pins which give it a firm hold at the end of the cement body. The pins serve the additional purpose of separating the ends of the plate from the blocks and of holding the parts of the stiffening frame in proper relative position while molding the cement body. They are securely riveted into the plate at their lower ends.

HOW TO MAKE PLASTER OF PARIS PLAQUES.

These make very pretty, yet inexpensive decorations for the wall. Any one can make them as the process is very simple. Take any picture you desire, cut it out and lay in water for a second or so, says the Home Bazaar. Next, take a smooth dish or enameled pan and lay the picture smoothly face downward, on the bottom of the dish. Wipe up the surplus water and smooth all wrinkles out of the paper. Then put your plaster in another dish and mix with enough water to make it rather thick. Pour quickly over the picture and smooth off the surface with a spoon. Have ready a piece of ribbon, one end of which is made into a bow, the other plain. Insert the plain end of the ribbon into the plaster before it dries, then put to one side to set. When thoroughly dry take out of the mold and you will have a very pretty picture. The plain surface may be tinted any color you desire. With a little color and gold enamel, some very beautiful effects can be produced.

Edison's Theory of Radium

Believes There are Rays or Vibration in Ether of Which Man Has Had No Knowledge

BY THOMAS A. EDISON.

I believe my theory of the phenomena observed in radium, thorium and uranium answers all the questions that can be raised regarding them without destroying any of the results of modern scientific research. It is surprising, when you come to think of it, how little the greatest scientists in the world know about the chemical and physical principles that underly the universe.

In the absence of absolute knowledge one theory is as good as another, as long as it meets all the requirements of practical tests. My theory may be upset tomorrow, but today I look at it as the best of all.

The phenomenon that brought radium into world-wide attention is its apparent property to giving off luminous and actinic rays, accompanied by heat, without apparent loss of energy or dimunition in bulk and weight. For a time it looked as though there were perpetual motion. The theory that radium actually does, out of its own tremendous energy, emit light and heat has been accepted in many quarters. It was repugnant to me, however, for I stick to the belief that you cannot obtain energy without first supplying it from some other source.

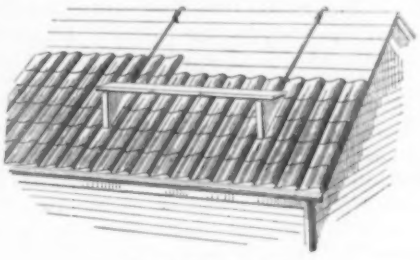
After a great deal of study and thought I have come to the conclusion that radium, thorium and uranium are not energetic in themselves, but are rendered radio-active or fluorescent just as tungstate of calcium and similar substances are affected by the X ray. I believe it probable that there are rays or vibrations in ether which we have not discovered, of which we have had no conception, hitherto, which are everywhere present, set in motion from some unknown source, possibly from some other planet or sun, and that these rays make their presence known by their action in causing radium, uranium and thorium to emit light and heat. ,

We have known of the X-rays for nearly ten years, but we have only found three substances which are rendered fluorescent or capable of giving off light by their agency. These substances, in order of their fluorescent powers, are platinum baryum cyanide, tungstate of calcium and euprocyanide of potassium. It is a peculiar co-incidence that the only one of these substances, tungstate of calcium, that is ever found in a natural state, is always more or less intimately associated in nature with the pitchblende from which all the radium in the world has been produced.

I am through with X-rays, radium and everything of the kind. Not only is my left eye badly affected by the Roentgen ray, but I am having all kinds of trouble with my stomach, due, I believe, to leaning over an X-ray machine while experimenting.

SCAFFOLD FOR LAYING METAL OR TILE ROOFING.

In the accompanying sketch a roof is shown to be covered with metal tile and showing one kind of scaffolding which has been highly satisfactory. There is always room on the ridging to fasten the hooks, says the Metal Worker, and the ropes hold-



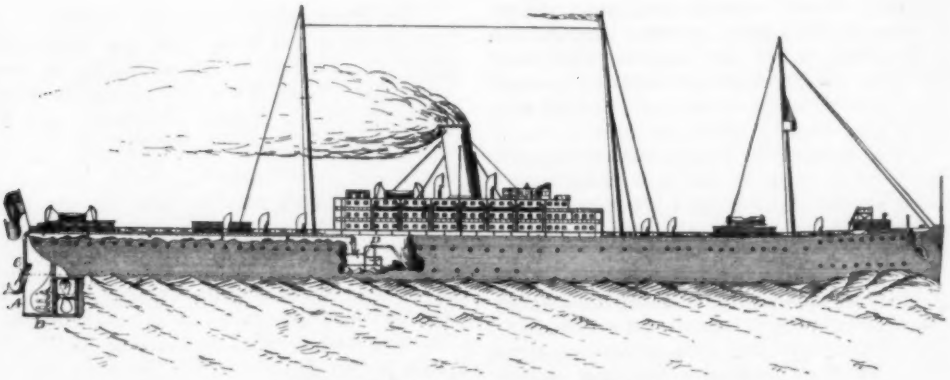
Laying Tile Roofing.

ing a scaffold can be adjusted to the position in which it is needed. The roof can either be lined with a chalk line, commencing at the eaves, or a movable string can be used as a guide for laying the tile. This is the only way to apply either metal or earthen tile and keep them straight and plumb. Regarding the tile running diagonally, there should be no trouble in this respect with metal tile when laid by a good workman with care. Finish a metal tile roof at the ridge with a special ridging after the tile laying has been completed.

The first tugboat fitted with wireless telegraphy in the United States is the Robert Palmer in the harbor of Portland, Me., which was used as a scout ship during the naval maneuvers.

AUTOMATIC GOVERNOR FOR SHIP'S ENGINES.

The danger constantly exists on every voyage, of the propeller rising out of the water and causing the engines to "race" or "runaway." In doing so shafts are broken and the entire expensive machinery in the engine room is often wrecked. At present the engineers do the best they can and control the engines by shutting off steam when the ship pitches at the bow and rises at the stern. But often there are two or even three distinct seas running in a storm, and while the ship may appear to be on an even keel the screw is well out of water. Capt. Charles Dickenson has devised an automatic governor which is placed near the screw and connects to the throttles of the engines by chains. When the screw is out of water it instantly shuts off steam.



Dickenson Patent Marine Engine Governor.

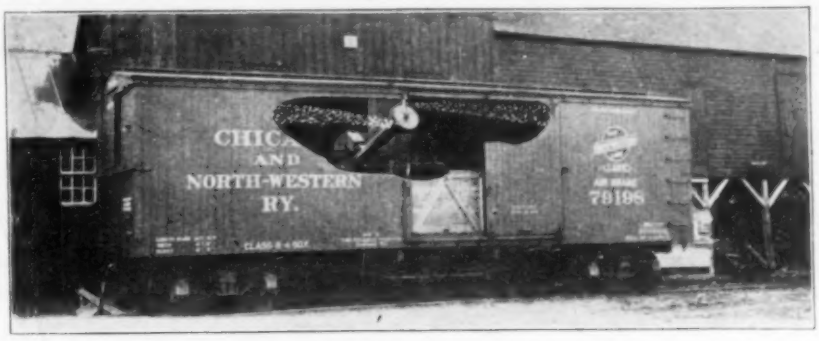
HOW TO MAKE CIDER AND KEEP IT SWEET.

The following was selected as the best article written for a prize for the Indiana Farmer, on how best to make cider and cider vinegar: Early apples do not make the best cider. October is the best time to make cider for vinegar. Some say use only the sound apples for this purpose, but we find the small, bruised and defective apples are all right, so they are free from rot. The vinegar will make itself more rapidly if some sweet apples are used. The barrels used should be sound, and made clean and sweet by thorough scalding. A neighbor keeps cider sweet for a year by making it the latter part of November and adding a little more than a pound of fresh mustard seed, and three quarts of milk, to a barrel of vinegar. This is not an intoxicating drink, and it will not make good vinegar. It is claimed horse radish root will keep cider sweet, but it gives the cider an unpleasant flavor we think. There is a preparation in the form of a powder that will keep cider for a long time without change in taste, but we have never used it for fear it contained some acid not wholesome. The old way of putting the fresh cider on the stove, and when it comes to a boil seal airtight in bottles, jars or jugs, is the best way we have found to keep cider sweet and wholesome.

One may have strong vinegar at all times by never allowing the vinegar barrel to get more than two-thirds empty, and keep filling up with the oldest cider, and add no water at any time There is a rapid method of making vinegar by running the fermented cider slowly through a box of beechwood shavings wet with old vinegar, allowing it to drip in another barrel. The quickest and easiest way we have tried is to add a little old vinegar, with some of the "mother of vinegar," to the fermented cider, and, last but not least, brown sugar or molasses, about one gallon of either to an ordinary barrel of cider. The sugar or molasses is a valuable aid when one wishes to make vinegar in a hurry. To make vinegar quickly a warm temperature is required. A small keg or cask may be kept in the kitchen as near the cook stove as posible, where it will make good, strong vinegar in a little while, if treated according to above directions.

LOADS THE CAR WELL AND EVENLY.

Blowing the grain to all parts of the car and saving the work and annoyance occasioned by the old system in which the spout stacked the grain all up in one pile, the screw conveyor car loader may be proclaimed one of the most convenient and economical devices the elevator man has contrived in many a day. Now, when the loading spout has no great fall, a car loader is considered a necessity. The screw conveyor forces the grain up grade by means of a rotary device to the end of a tube, where there is a fan that performs the work of distributing. The fan is located at the center and top of the car. It is incased in drums having adjustable openings at the top and bottom. The car is thus loaded evenly in all parts, or, if desired, it can be so arranged that only one end of the car is loaded at a time. The conveyor's rope drive is extended up to the top of the elevator and is utilized also for operating extension of the belt to farther chutes.



Loading Car With Screw Conveyor Loader

MAKING TOYS IN GERMANY.

For two centuries the Germans have been the toy makers for the world, the work being largely done by hand at the homes of the workmen. The earnings of entire families engaged in the work are very low, ranging from $1.42 to $4.75 per week. Of necessity they must live cheaply, their diet being chiefly potatoes, linseed oil, black bread and coffee, with meat occasionally on a Sunday. Immense factories are now driving these people out of employment, as they refuse to leave their mountain homes for the mills in the cities.

VANDERBILT'S TURBINE YACHT A WONDER.

W. K. Vanderbilt's new turbine yacht Tarantula is the latest American wonder of the sea. It is a steel vessel and resembles nothing so much as a torpedo boat. The Tarantula is said to be the fastest yacht in the world, with the exception of Charles R. Flint's Arrow, which has run over a measured knot in one minute and twenty seconds. The Tarantula covered 23¾ knots in an hour on her trial trip. Afterward she is understood to have done 26¾ knots. She is 152½ feet over all, 15 feet 3 inches beam and 8 feet 4 inches deep. She has a displacement of 150 tons. She has nine screws on three shafts and is the first vessel to have the Parsons' marine steam turbine. Besides her swiftness, the most noticeable feature is the absence of vibration. There are only two other turbine yachts, George J. Gould's Emerald, built by Sir Christopher Furness, described in a previous issue of Popular Mechanics, and A. L. Barber's Lorena.

SCHOOL FOR WIRELESS TELEGRAPHY.

The latest thing in the way of a school is one to teach wireless telegraphy and wireless telephony. The course comprises a full knowledge of the science and practice of this new and rapidly growing industry, and opens up a new field of usefulness to many young men.

Santos Dumont, according to the Temps, is going to Brazil to restore his broken health and accordingly the experiments with military automobile baloons have been postponed.

Elevator Loading Spout 115 Feet Long

QUEER GRAIN LOADING SPOUT.

An elevator loading spout 115 feet long with an incline of but about 20 degrees has been installed at the elevator of S. N. Knudson, Mondovi, Wis., and to the surprise of grain men everywhere it works with splendid success. Old elevator men supposed that with such a small slant the grain would clog and the spout would refuse to work. The Grain Dealer's Journal says:

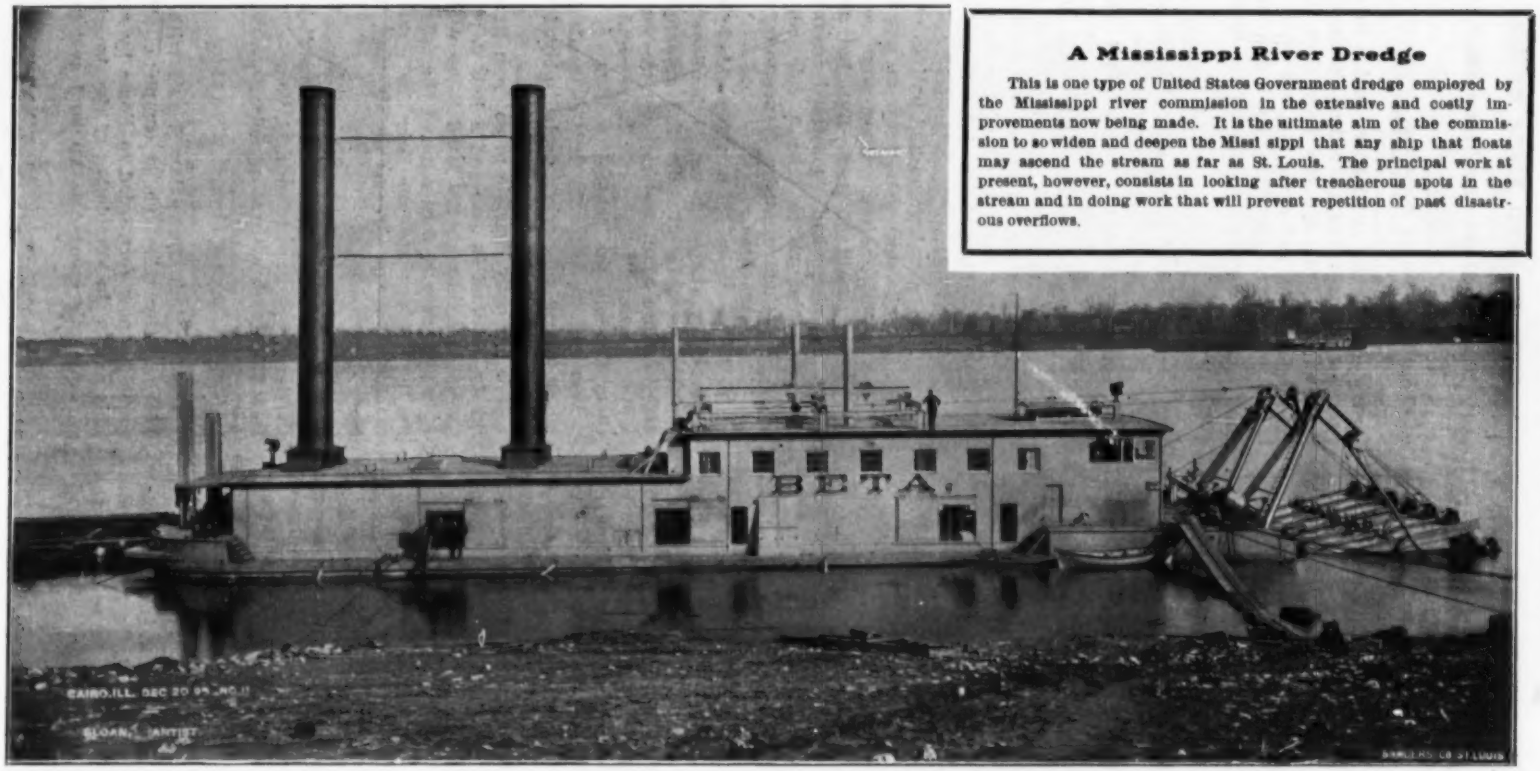
"That a spout with such little slope could be made to work was very doubtful; but Mr. Knudson went ahead with the construction of his elevator, feeling sure the grain would flow. His judgment was vindicated for the spout works well except in rainy weather."

Mr. Knudson tried to buy land adjoining the railroad track to build his elevator, but not being able to do so, he went to work and built the elevator on his own ground and extended the spout to the railroad, which answers the purpose almost as well as having the elevator beside the track. The spout is 6 inches in diameter and is supported by three sets of shears made of tall poles.

Spout Entering the Car

To avoid a recurrence of underground accidents like the Paris horror, officials of the Berlin underground and overhead railway have been ordered by the German government to light all tunnels by wires wholly disconnected with the motor current, and to install apparatus enabling train hands to break the traffic current anywhere and thus stop trains approaching the scene of an accident. The officials are also ordered to cease overcrowding cars.

With an initial payment of $500,000 cash a Boston firm has concluded a deal for 400,000 sides of heavy hemlock sole leather valued at nearly $2,000,000. This is the largest purchase of leather ever made.



A Mississippi River Dredge

This is one type of United States Government dredge employed by the Mississippi river commission in the extensive and costly improvements now being made. It is the ultimate aim of the commission to so widen and deepen the Missi sippi that any ship that floats may ascend the stream as far as St. Louis. The principal work at present, however, consists in looking after treacherous spots in the stream and in doing work that will prevent repetition of past disastrous overflows.

The Mississippi River Commission Dredge "Beta"

Is one of several similar machines employed on the "father of waters," in the work being done by the United States government. The "Beta" is a powerful machine and is specially adapted to river work. She has recently been equipped with a new 1,50 horse power Heine boiler that has added greatly to her efficiency. In the new boiler the gases of combustion pass over the bridge wall to the rear, through a roomy combustion chamber, then turn up and forward through a nest of tubes At the front end the gases turn up and backward under the shell of the boiler to the rear where they turn upward into the uptake. The trend of the gases while in contact with the heating surface is parallel to the tubes and the shell, being directed by baffle tiling.

A FILIPINO "AMBULANCE."

Crude Device In Which the Natives Bear their Wounded From the Battlefield

The Filipinos have no ambulances or other modern canveyances for carrying their wounded from the field of battle to the camp where they may receive medical attention, but a kind of litter of their own crude construction seems to answer the purpose very well. The litter is made of bamboo and grass interwoven and a blanket above serves

Filipinos Carrying their Wounded

as a canopy to protect the patient from the sun. The ends of the litter are hitched to a long pole, by means of which the Filipinos bear it on their shoulders. Often the island soldiers tramp many miles over the burning roads or through thick jungles carrying their wounded to camp or to places of safety. There were many of these litters in use during the recent hostilities as thousands of the natives fell victims to the deadly American bullet.

CONSULAR REPORTS IMPROVING.

The consular reports issued daily by the Department of Commerce and Labor show a great improvement over a few months ago when issued by another department. The quality and quantity of the matter are both better and a much wider scope is given. Evidently somebody has hired an editor.

The Baltimore & Ohio railroad proposes to make Lorain, O., its largest shipping point for coal and iron ore and for this purpose $1,000,000 is to be spent in enlarging the dock facilities there.

AUTO IN DEAD RIVER REGION.

Deer Dazzled by Light—Lumbermen and Natives Frightened

[By James B. Dill, the first person to go through the Dead River region of Maine in an Automobile.]

We crossed the Dead River region in one and a half days and arrived at Portland at 5 p. m., Sept. 15. We saw three deer from the automobile, and made the last ten miles atfer dark. The acetylene gas lamps made fine "jacks," as the hunters call the torches used in hunting.

We drove within twenty-five feet of a magnificent buck, who stood at the edge of the road, dazzled by the brilliant light. The buck stood with his head up in the air, and would have been struck by the motor car had we not tooted our horn. At the first sound of the horn he jumped back into the dense woods.

Lumbermen and natives along the route never saw an automobile before. They were much afraid of it at first, but after one had mastered courage enough to take a ride, all of them wanted a chance to try the machine.

From the northern side of the Dead River region down to Madison the farmers were terrified by the automobile, and in more than one instance we waited while they unhitched their horses and led them far into the fields.

Men and women alike in the woods had never seen a motor car, and displayed the greatest curiosity and interest.

It is perfectly feasible to go from Rangeley to Portland in two and a half days by automobile through the Dead River region. It is necessary to ford some of the streams, as the bridges are too light for a heavy machine, but the streams are shallow, and have good bottoms.

Down the Kennebec valley to Brunswick the roads are fine, but from Brunswick to Portland they are not so good, being cut up into ruts, and with sticky clay.

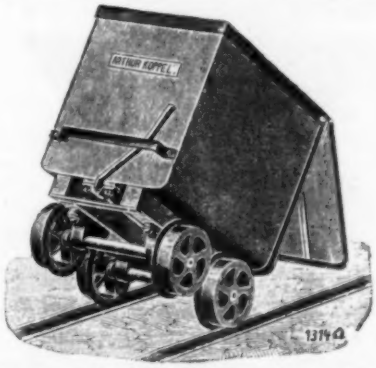
TELEGRAPH CROSSES ALASKA.

The last link connecting Seattle with St. Michael's by telegraph is complete. Messages are now forwarded to Nome by mail. This marks the completion of the American government's great Alaskan land system.

An Age of Odd Looking Cars

Queer Little Vehicles of Every Conceivable Size and Shape Used in Modern Commerce

This is an age of peculiar cars. More different styles of queer looking vehicles to run on rails have made their appearance during the past year than in a decade be-



Ore Car with Door, Wooden Frame, Capacity Ten Cubic —18 Inches Gauge

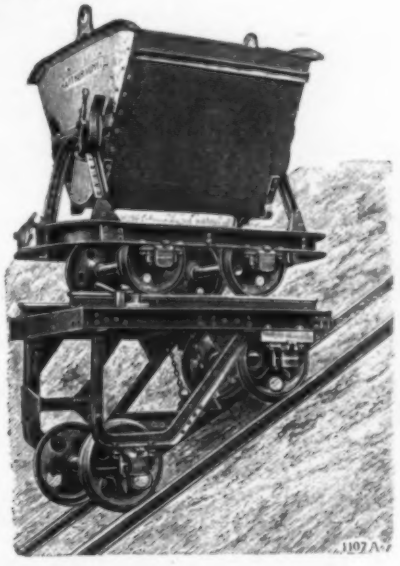
fore or probably in a century. In the building of these "freak" appearing, but really useful cars, America leads the world. Uncle

Steel Dump Car—Dumping to End

Sam has shipped them to all parts of Europe, to South Africa, and all over the tropics.

Car for Hauling Barrels

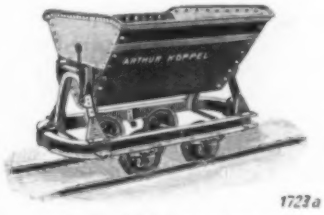
Now almost every branch of commerce has one or more styles of cars peculiarly its own. Most of them, of course, are for narrow gauge railways used by manufacturing plants of every description, mines, plantations, contractors, etc.



Car Built for Climbing Mountain Sides

One manufacturer alone, Arthur Koppel, has probably built 500 different types of cars in the last year, together with the roads on which they run and other equipment.

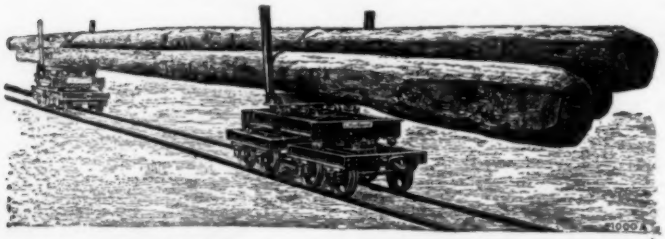
The V-shaped car is probably the most familiar. They are generally used for carrying sand, clay, earth, stones, cinders, ashes, coal, shavings, etc. This class is divided into many subdivisions, formed by lighter or heavier construction, different axle boxes or drawbars, different arrangement of box, etc. The standard V-shaped dump



Steel Side Dump Car

cars are built entirely of steel.

There are slatted cars built for carrying

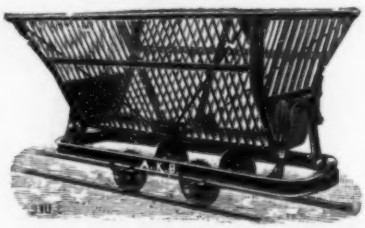


Special 16-Wheeled Car for Carrying Long Masts and Telegraph Poles

sugar beets, bagasse, straw and similar light materials that occupy much space in proportion to weight. There are square dump cars, dumping to one or both sides, made

Square Box Dumping Car

with frame and box of wood or with frame of steel and box of wood or with frame and box of steel. Many of them have a very

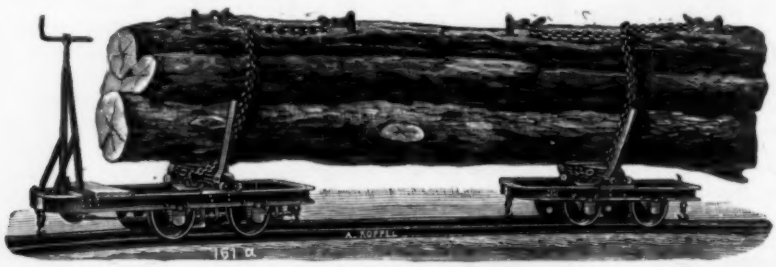


Car for Carrying Bagasse, Straw, Etc.

pairs of trucks and two bridges for carrying the timbers.

Flat gondola and box cars are made in every conceivable design. The illustrations show such a car with steel frame, made from 10 to 20 feet long, 3 to 5 feet wide and weighing from 3 to 7 tons.

Box cars are made in small sizes of from 2 to 5 tons. Little passenger cars are made, for various kinds of usage, some for pleasure trips over saw mill tram roads, or over the narrow gauge road on the sugar plantation, etc. Some of these are extremely

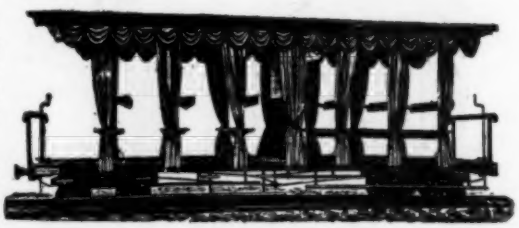


Log Truck with Turning Supports

ingenious spring gate and tipping apparatus.

Mine cars are heavy, bunglesome-looking devices, but splendidly adapted to the uses they serve. Some of them are V-shaped and some square shaped and are made to dump to the side or to one end.

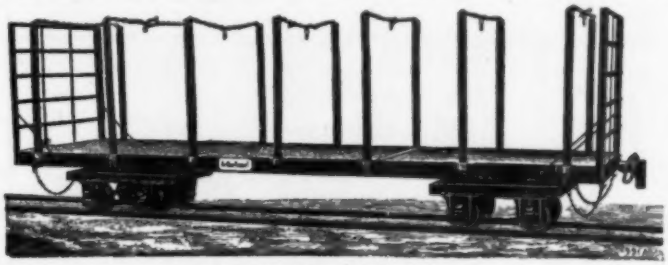
Then there are very comical looking cars used for carrying telegraph poles, masts and other especially long poles from far in the woods to the railways. The picture shows a special 16-wheeled car, consisting of two



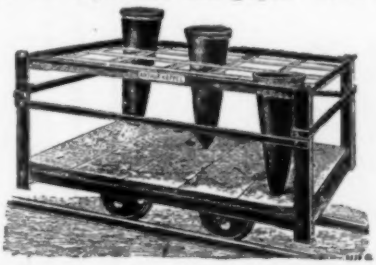
Eight-Wheeled Passenger Car for Narrow Gauge—Seats Thirty Passengers

handsome, and may seat as many as 30 passengers.

But the oddest of them all are the deformed-looking cars built to climb up and down the sides of great mountains without spilling their loads. These are built for all grades, no matter how steep, and of nearly all capacities and gages. It is difficult to determine what many mining and other enterprises would now do without these vehicles. There is a kind of car on top of a car, or a car on a rolling track, or a double car, built so that the upper car can roll off the lower at any time desired onto a level track and continue its journey.



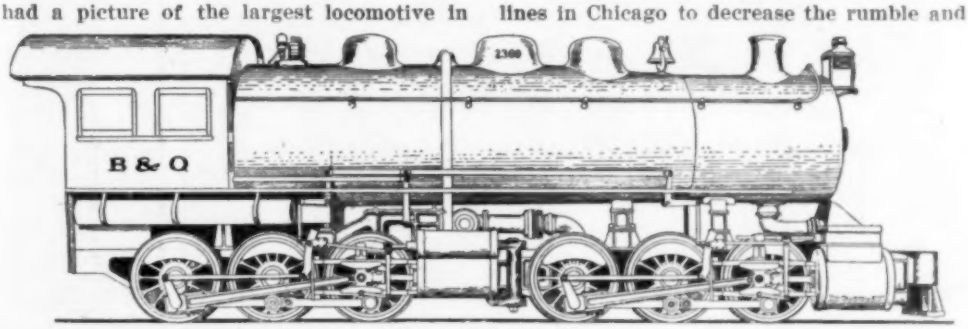
Flat Car with Side Stakes and Guards



Car for Carrying Sugar Loaves—Twenty-four Inches Gauge.

ANOTHER "LARGEST" LOCOMOTIVE.

It is now several weeks since we have had a picture of the largest locomotive in the world. However, here is the very latest which is nearly completed at the Schenectady Works. It will go in service on the B. & O. as a "helper" engine to assist freight trains over heavy grades. This locomotive, absolutely the largest in the world today, weighs 270,000 pounds, carries a steam pressure of 235 pounds, and has a total heating area of 4,325 square feet. The high pressure cylinders are 20 inches diameter and the low pressure 32 inches. The stroke is 32 inches. The rear set of driving wheels are driven by the high pressure, and the forward cylinders are low pressure. The engine and tender weigh 415,000 pounds, besides the weight of the 2,000 gallons of water and the 13 tons of coal carried. The engine will probably be taken out of service next summer and exhibited at the St. Louis fair.



Latest Largest Locomotive.

Commander Robert E. Peary has been granted a three-years' leave of absence from the United States navy for the purpose of making his fourth attempt to reach the North pole. The expedition which will start July 1, next, will be a distinctly American one. The Peary Arctic Club of New York will furnish $150,000 toward financing the expedition.

A proposition has been made by experts to reconstruct the roadbeds of the elevated lines in Chicago to decrease the rumble and roar caused by passing trains. It is proposed to imbed the rails in concrete.

Pictures Prevent Street Car Accidents

NOTICE!
These Photographs Illustrate the Incorrect and Correct Way of Getting Off the Cars.
G. W. CHANCE, Manager.
INCORRECT--Very Dangerous!
GETTING OFF IN OPPOSITE DIRECTION CAR TRAVELS
THE RESULT!
Wait Until the Car Stops!!
CORRECT WAY to Get Off!
FACE ABOUT HALF WAY TOWARD FRONT OF CAR AND SIDE

Incorrect and Correct Way of Getting Off Cars

An effective method of preventing street car accidents in Sault Ste Marie, Mich., has been devised by G. W. Chance, manager of the International Transit Co. and the Trans-St Mary's Traction company of that city. A set of photographs, from which the accompanying illustration is taken, is posted in each car. In the picture however, the usual conditions as shown are reversed, as it is the woman who is getting off the car the right way and the men the wrong way. Everybody knows a woman can learn anything quicker than how to get off a car, while the knowledge comes very quickly to a man. The result of posting the pictures has been to lessen the number of accidents in Sault Ste. Marie by one half. The company has thereby saved large sums in damage suits and the public has been spared many bruised backs and broken bones.

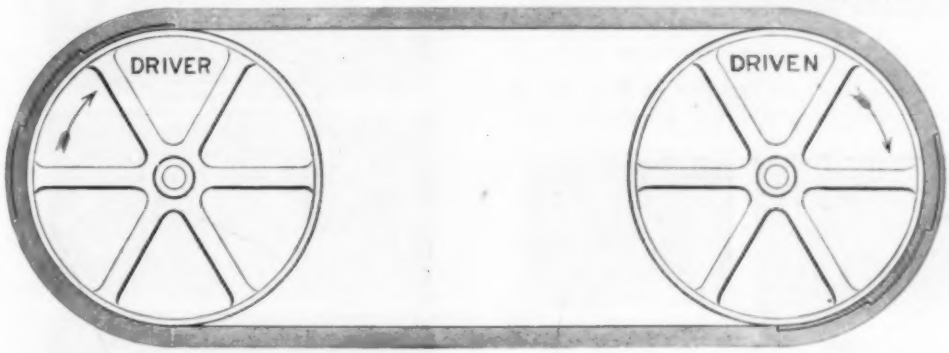
SHOP NOTES

HOW TO LACE RUBBER BELTING.

(Copyrighted by James Bennett Forsyth.)

As rubber belting is not quickly affected by heat, cold or moisture, it is especially desirable and economical for use on agricultural machinery, in elevators, mines, paper, flour, saw, and woolen mills, dye and print works, bleacheries, and many other places, either for the transmission of power or as conveyors.

The belt to be adjusted to the pulleys



should be cut shorter than the distance around the pulleys by one-eighth to one-fourth of an inch (depending on the thickness of the belt) for every foot in length, when measured, with a metallic tape or wire drawn tightly around the pulleys. For belts 16 inches wide and under, make two rows of holes in each end as per table, thus obtaining a double hold, butt the two ends together, and unite with lace leather. This is the best method of lacing belts.

Belts up to 24 inches wide may be laced by this method, and the table covers this width, but we advise the use of the lap splice for all bels over 16 inches in width.

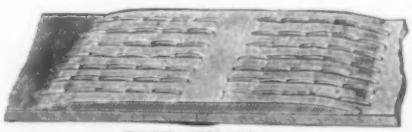
Square the ends of the belt accurately, and after the location of the centres of the outer holes on the first row has been determined from the foregoing table, divide the intervening distance into an even number of spaces, making them as nearly equal as possible to the distance that the outer holes in the row are from the edges of the belt, but the length of the divisions should not exceed this distance.

Punch holes at every other point in the first line, and at the intermediate points in the second row. The diameter of these holes should be about three-fourths the width of the lacing used, which width is given in the table above.

Begin to lace at the centre, lacing toward one edge; return to centre, cross to other edge, and back to centre, finishing with both ends of the lacing in the same hole, but entering it from opposite sides of the belt. Make a hole with a belt-awl about ½ inch from the hole at which the lacing was started and finished, tuck both ends of the lacing through this awl hole, pull tight and cut them off, leaving about ½-inch ends.

BACK SPLICE.

For wide belts a piece of leather or rubber belting may be put on the back to



BACK SPLICE

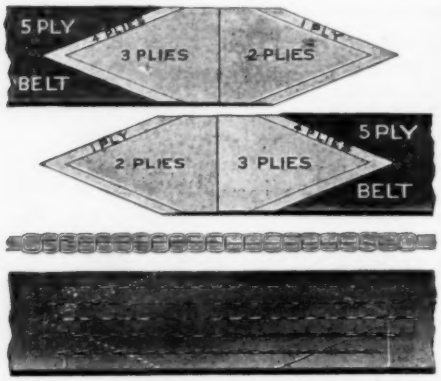
SIDE VIEW OF BACK SPLICE

strengthen the joint, equal in length to about 1½ times the width of the belt and sewed to the belt.

LAP SPLICES.

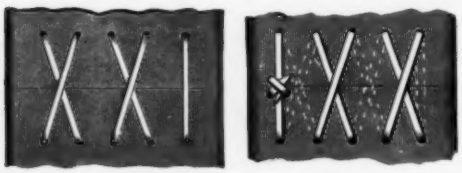
For belts 18 inches or more in width lap splices should be used; one method of making it is as follows: Scarf the ends by removing a portion of the splice of duck, care

being taken not to cut the plies under the portion to be removed. Cover both scarfed surfaces with rubber cement, and when dry

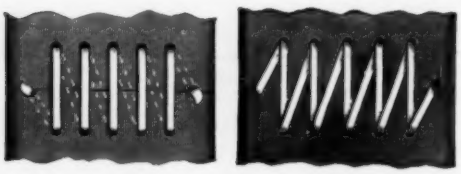


Finished Diamond Lap Splice

bring the two ends together so that they fit each other properly; roll or pound them



Pulley Side Outside



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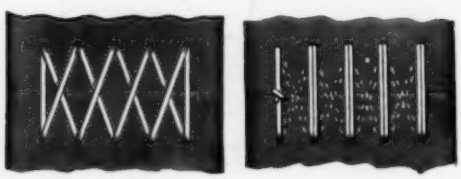

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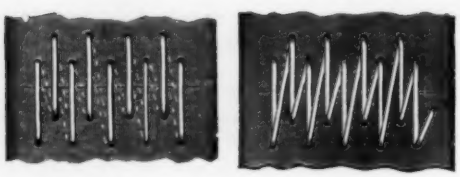
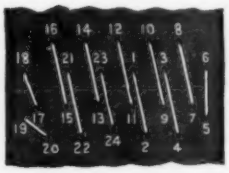
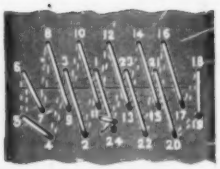


Pulley Side Outside





Pulley Side Outside

firmly together and then punch carefully and sew with narrow lace leather. When practical the splice should be protected in the following manner: Cement the sur-

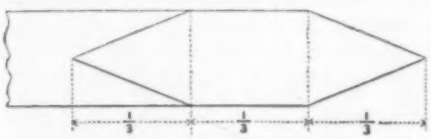
Methods of Lacing and Fastening Rubber Belting

faces between the rows of sewing and when dry fill these spaces on the pulley side with strips of rubber-coated duck, then cement the whole surface of the splice and cover with duck having rubber on one side, the duck side out, next to the pulleys. The strips and cover should be firmly rolled or pounded onto the belt.

Length of lap splices should be as follows: For 8-inch belts, 24 inches; 12-inch belts, 30 inches; 16-inch belts, 32 inches; 24-inch belts, 36 inches; 30-inch belts, 40 inches; 48-inch belts, 48 inches. Other widths in proportion.

Another method of making lap splices is known as the Diamond lap splice. It is made in a similar manner to the ordinary lap splice previously described, except that the ends are cut pointed instead of square. The right angle and diagonal lines show where the plies are cut. The edges of the plies should be scarfed to insure a close fit.

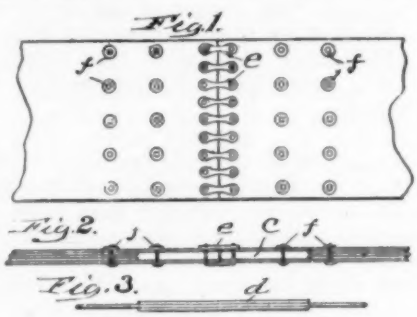
Following are the dimensions for diamond splices: For belts from 6 to 9 inches inclusive, 24 inches long; from 10 to 15 inches inclusive, 24 inches long; from 16 to 24 inches, 36 inches long; from 26 to 32 inches, 42 inches long; from 34 to 48 inches, 48 inches long; this length to be divided into three equal parts, as shown below:



Wire for belt lacing is made from a composition which makes it practically adapted for the purpose for which it is intended, and in many cases an excellent substitute for lace leather or other belt fastenings. The length of wire required to lace a belt is from seven to nine times the width of the belt, according to the thickness of the belt.

SPLICING A LARGE RUBBER BELT.

The drawing shows a rubber belt splice for large driving belts that is stronger and runs smoother than a common lap splice. Fig. 1 shows the completed joint. Fig. 2 is a side view showing rivets, f, Smith's belt fasteners, e, across the joint and c. To pull off plies to fit the tongue, which is shown in Fig. 3, leave the tongue as long as wanted, according to width of belt. Use rubber cement to stick the joint where lapped, says the American Miller. If well made the splice need not be thicker than the remainder of the belt, and will last longer than a common lap.

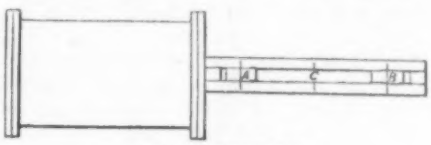


Splicing Large Rubber Belt

SETTING ENGINE VALVES.

In setting the value on a steam engine care should be taken to see that the piston is right. To go this, according to a correspondent to the Blacksmith and Wheelwright, disconnect the connecting rod at both ends, push the cross-head until piston strikes end of cylinder, as shown at A; put a plumb level down face of guides near middle of crosshead, draw a line down so it will show on crosshead and both guides. Now move crosshead to the opposite end until piston strikes B; draw plumb-line down face of guide same as on the other end, making it intersect with line of crosshead. With dividers find the center between the lines on both guides; draw a line down these two points, as shown by C; move crosshead to line which intersects with center lines.

Now the piston stands correct in center of cylinders. Put on a trammel or make 5-6



Setting Engine Valves

rod sharp at points; bend shape of trammel and take the center bore in crosshead pin and center in engine shaft, not the crankpin, but the center bore in shaft. Set your points to these.

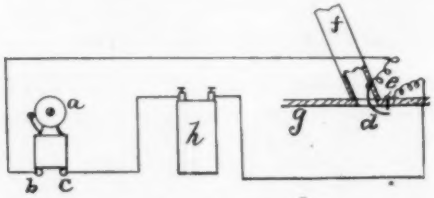
Now put brasses on rod, key up and put a piece of wood in both brasses. Find the centers by dividers. If the rod is right, your trammel points will just find the two centers of your brasses. If rod is too short, put in liners between brasses and rod; if too long, shorten it, get it the correct length, put it on and your engine is right in cylinder. Some men will put liners to give draft between brasses and rod. You will see this lengthens the rod and spoils the run of engine.

SIMPLE ELECTRIC BIN SIGNAL.

An electric bin signal which any one may construct at slight expense is described in the American Miller.

It consists of the following: One iron box bell, one dry battery and sufficient wire to allow the bell being set in some conspicuous place where it can be heard.

In the diagram, f is a wheat spout that



Electric Bin Signal

discharges at top of bin g; e is a screw that extends through the top of the bin; d is a piece of zinc or iron the width of spout and held in place by a bolt coming through spout. As the wheat fills the bin and begins to back up in the spout, it brings plate d in contact with screw e. This completes the circuit and rings the bell, which may be placed in the office or engine room.

HINTS TO INVENTORS.

The Department of State has received from the Austro-Hungarian embassy at Washington, July 9, 1903, copies of specifications and plans, in German (which may be seen at that Department), for a ship-lifting device on the Danube-March-Oder Ship Canal, for which competitive prizes of 100,000, 75,000 and 50,000 crowns ($20,300, $15,225, and $10,150) have been offered by the Austrian Minister of Commerce.

RESTORING BLUE PRINTS.

Overexposed blue prints can in many cases, be restored by immersing them in a bath of weak ammonia, using about two spoonfuls of ammonia to a tumblerful of water. This will cause the print to turn first purple then pink and after a time nearly white. When it has reached the pink stage rinse it and immerse in a bath composed of one teaspoonful of hydrochloric acid in one tumberful of water. The blue color will then return much brighter than before, but this time the lines will be white and clear. Wash thoroughly before drying.

HOW TO BROWN A GUN BARREL.

The usual material used for browning gun barrels is a mixture of chloride (butter) of antimony and olive oil. This mixture is rubbed on and allowed to stand for a time—sometimes for days until the proper color comes, says the Keystone. A mixture of dilute nitric acid and vinegar will also make a nice bronze. All openings, like the muzzle and breech, are closed with corks dipped in hot melted tallow, to preserve the inside from the chemical action of the bronzing fluid. Iron articles inclosed in a close box and exposed to hydrochloric acid vapor are also bronzed. Here again the openings must be plugged. In all instances, after the bronzing is complete, the articles should be scrubbed with water and a stiff brush, then dried by heat, and coated with wax or a mixture of wax and turpentine or benzine. Bronzing like the above should not be confounded with the deep slate-blue of guns and pistols, which is done by protracted heating in a muffle filled with superheated steam, nor yet with the still richer mottled appearance on gun locks and trimmings. This effect is got by a process of case-hardening in iron vessels; the iron articles to be treated being finished and packed in leather shavings or bone dust, which entirely excludes the air. The articles so heated are plunged into cold water, which hardens the coat of steel formed on the outside by the case-hardening process. The mottled appearance comes from heating.

FEED-WATER HEATER.

To find the heating surface required in feed-water heaters, a quick rule is to divide the known pounds of feed-water used per hour by 100 for copper, 90 for brass and 60 for iron pipe. The quotient will represent the required number of square feet of heating surface. This method of calculation applies particularly to the coil type of heater, in which the circulation of feed water is generally more rapid than in heaters of other types.

It is announced by a member of a special board of the ordinance department that the United States has adopted the improved Springfield rifle and will discard the Krag. The new weapon will be seven pounds in weight while the Krag now used, weighs nine.

HOW A STORAGE BATTERY WORKS.

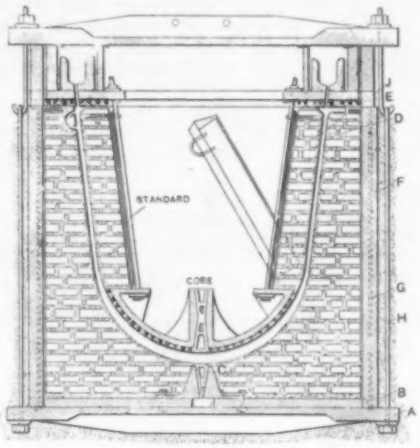
The popular impression is to the effect that a storage battery stores up electricity, and that the bottled-up fluid is held somehow under pressure, to be released on demand like highly charged mineral water. The principle of the storage battery is quite different from this, as the entire action is chemical, fundamentally.

The storage battery is a simple piece of apparatus, mechanically, says the Engineering Magazine. In its most familiar form it consists of two lead plates supporting active materials, a high oxide of lead for the positive plate, and metallic lead in a spongy, finely divided state for the negative. The plates are immersed in dilute sulphuric acid and contained in a glass, jar or wooden tank lined with lead. Two plates, one positive and the other negative, constitute a couple, and a cell may be made up of as many couples connected in parallel as the requirements of discharge necessitate. That is, all the positive plates are connected together separately from the negative plates, which are themselves joined in one aggregation independent of the positives. A battery consists of a considerable number of cells connected usually in series—that is, the positive group of couples in each cell is joined to the negative group of the preceding cell, so that the electric current passes through all the cells, seriatim.

Now, "charging" a storage battery simply means passing a continuous electric current through it from some outside source of supply, as a railway or lighting generator, and thereby causing certain chemical actions to take place. The energy of the current is thus stored up as chemical changes and recombinations, or in other words it is transformed into potential chemical energy. "Discharging" a battery is naturally the reverse of the process just indicated. The battery is connected to a railway, lighting, or general power circuit, and it at once begins to deliver current, generated by the reversed chemical actions which begin to take place as soon as opportunity is given for a current to flow. Back goes the battery towards its original uncharged condition, and the cycle may be repeated over and over again, always with the same resulting chemical actions caused by, and then causing, the electric current.

THE USE OF PERMANENT MOLDS.

Foundrymen will be interested in a method described by J. A. Murphy, in a paper read before the recent meeting of the American Foundrymen's Association, for casting from permanent molds. The system



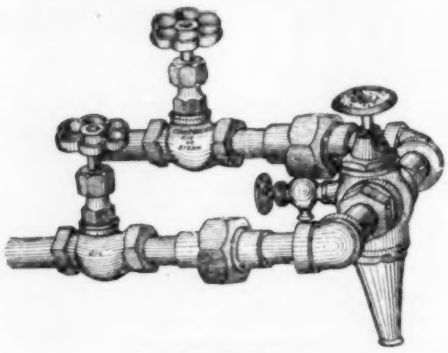
Permament Mold for Iron Kettle

is particularly well adapted to large kettles, pans, domes, and pipes. Our illustration, from Machinery, shows a mold for a kettle weighing fourteen tons that will last for several years' continual use, turning out a kettle every few days. The core is swept up and is preferably dried in an oven. A pit is dug in the floor in some convenient location and the binders A and the bottom plate B are set in place; and the spindle step C for the mold sweep by which the interior of mold is swept up. The brickwork is laid so as to allow a thickness of from ½ to ¾-inch of loam. If the bricks are not of good quality, it is best to use firebrick for the face. Upon the top of the wall is placed a strong cast iron ring E, which is recessed to clear the eight iron frames D. These latter are for the reception of cores for handles, brackets or other projections, and can be removed without disturbing the wall. Other details as explained in the paper are such as to avoid the disturbance of the brickwork when a casting is stripped.

A method of rendering wood fire proof, known as Dr. Jones' method, is to subject the wood to a pickling process in a solution of tungstate of soda and water. The People's Encyclopedia suggests a solution of silicate of soda. Another recipe—2 pounds alum, 2 pounds sulphate copper, 100 gallons water. Soak 5 days.

MORAN LIQUID FUEL BURNER.

The oil burner herewith illustrated will heat from 22 to 25 square feet of grate surface and will equal a ton of good coal with 100 gallons of oil. There are no coal or ashes to handle, and the use of this device saves labor and gives dry steam. This appliance can be attached to all kinds of furnaces for melting steel, nickel, iron, copper, brass, babbit, lead or any other material requiring



Liquid Fuel Burner

furnace heat. It can also be used with good results for anealing furnaces, muffles or any furnace designed for annealing process, and can be attached to angle or plate furnaces used in boiler or marine construction. The oil burners are also affixed to rivet forges, portable or stationary, while their usefulness for working on a ship's side or hold, for heating bent or fractured plates, is apparent.

EFFECTS OF HARDENING AT BOILING TEMPERATURE.

The physical condition of the two pieces of steel of the same composition, heated to the same degree of heat, one chilled in water at a temperature of 70 degrees and the other chilled in water at 212 degrees would be widely different, says Sparks From the Anvil.

Assuming the steel to be of the small section indicated, say 1-16 inch thick, and of fairly high temper, the piece hardened in water at 70 degrees would be extremely hard and could be readily broken by the tap of a hammer, while the piece hardened in water at 212 degrees would be just the opposite. In fact, at this latter temperature of water, a piece of the same uniform thickness, and heated to the same temperature as the piece hardened in water at 70 degrees, would not harden, but would simply stiffen and toughen.

I might say that it would remain in almost its natural condition, owing to the heat of the water being so high that it would not absorb the heat from the piece fast enough to harden it. It would not be brittle, but would bend and set; an attempt to fracture it with a hammer would only cause it to batter down. Water at 212 degrees of heat is not a satisfactory medium in which to harden steel articles which require any hardness whatever.

TO PROLONG THE LIFE OF STEEL STACKS.

Persons having light steel stacks on their boilers may make them last as long again by riveting on three ribs of light channel iron and being careful to break joints. The channels should run the whole length of the stack on the inside This work must be done before the stack is raised. We put up a stack 42 inches in diameter by 90 feet high, made of No. 14 steel, 4 years ago. The stack was ribbed in this way and we also put in two cross braces. This stack was second-hand when we put it up, but it is still in very good condition. I do not believe we could have raised the stack in the first place if we had not strengthened it in this way.

A very nice fixture for an engine room is an engineer's set of oilers, together with the tray and stand. I recently made a stand in the following manner: I first found an old 3 11-16-inch shaft collar, which was used for the foot. In this I set a piece of 1¼-inch pipe, 3 feet long, and babbitted it solid. Then I screwed on the top of the pipe a coupling with a 1¼-inch plug in it, and drilled a ½-inch hole in the plug, so that a ⅜-inch nipple would work easily in it. I then tapped out one side of a ⅜-inch cross into which I screwed the ⅜-inch nipples and afterwards bushed down the four openings in the cross to ⅛ inch. Then short pieces of ⅛-inch pipe were screwed into the cross and the ends of the pipe bent up to fit the tray, and in this way the tray can be turned around.

TWO-STORY CATTLE CARS.

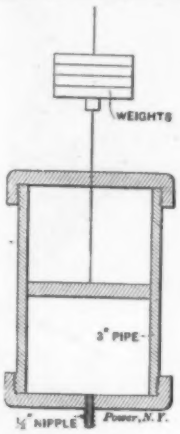
Some months ago a Russian engineer, M. E. N. Rykovski, brought out a new type of cattle car for use on the Russian railways. The cattle car is in two stories and can carry from thirty-two to sixty-four head of cattle. A trial of the new car has been made on the Samara and Zlatoust Railway, and the authorities have ordered it to be tried as a means of conveying cattle destined for exportation abroad, and especially to England. As the Russian railways have been built with level crossings instead

of bridges, these two-storied cattle cars will be able to circulate freely.

AUTOMATIC GREASE CUP.

I have some boxes on my line shaft which I cannot get at to oil when the engine is running; so I made a grease cup like the one shown in the sketch, which I have to fill only once a week when the engine is not running, says a writer in Power.

The cup is made of a piece of 3-inch pipe, 6 inches long, with a cap on each end. In one cap I drilled a hole for a ½-inch nipple, which screws into the cap of the box, and in the other cap I drilled



GREASE CUP.

a hole,through which goes a rod with a hardwood piston on one end. On the top end of the rod I put some weights to force the grease down into the box. If the cup feeds too fast, I take some weights off; if not enough, I put more on.

I used oil in these boxes before I put the grease cup on, and the oil grooves in the cap of the box were not large enough for the grease. I removed the caps from the boxes, cut deeper grooves in, and have no trouble now with these boxes running hot.

NOTES ON STEEL.

Sparks From the Anvil for July has the following notes on steel:

Do not forget that lead baths will heat steel unevenly unless watched and regulated; look out also that the heating does not terminate at an abrupt line.

Coiled springs hardened in oil are now frequently made to draw their own temper by being removed from the bath while still retaining heat.

Where high speed lathe tools show signs of brittleness, try reheating at the same heat as before, but instead of cooling in the air or in an air blast, bury the nose of the tool in ashes on the forge for a minute or so and then cool in the air.

Many toolmakers anneal expensive steel tools after roughing them out, so as to let the particles of steel readjust themselves when the internal tensions and strains are removed.

The internal strains which are set up in steel by the hardening process can be relieved, if it is not desired to draw the temper regularly, by warming the hardened article over a fire or in the mouth of a furnace, the piece being turned and moved about in such a way as to take the heat evenly. A bath of boiling hot water is effective if the piece is not large.

Does steel improve by age, or in other words, will a bar of steel that has stood in warehouse a long time make a better tool than one fresh from the hammers or rolls? Some persons think it does improve, and there are those who buy their steel ahead of requireents so as to season it as lumber is seasoned.

GERMAN LOCOMOTIVES FOR CANADA.

Twenty locomotives have been ordered from German locomotive builders in Chemnitz by the Canadian Pacific Railway. This is said to be the first time that an American railway has bought locomotives in Germany. They are to be two-cylinder compounds, for passenger service, with three pairs of drivers and a four-wheel leading truck. The loaded weight of the engine is 84 tons, the loaded weight of the tender 63 tons, or the total weight of engine and tender 147 tons.

PAPER FROM COTTONSEED.

A new process relates to the production of fibrous cellulose suitable for the manufacture of high grade paper from cotton seeds. The ginned seeds are treated in a suitable digester with liquid hydro-carbon vapor, and afterward in the same or in another digester for four hours with a two per cent solution of caustic soda under a steam pressure of 60 pounds, all traces of the hydro-carbon having been previously removed by means of a current of hot air. The material is subsequently washed and bleached. The coloring matter contained in the hulls is either extracted before the treatment with caustic soda or from the caustic soda solution.

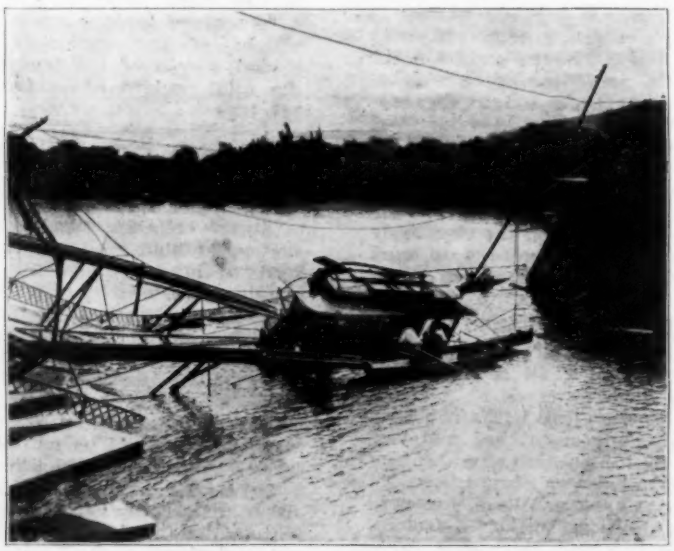
Charles M. Schwab has announced that the price of steel rails for 1904 will be $28 per ton.

DANGER OF OLD BRIDGES.

More careful inspection of bridges is needed in this day of growing American cities and increasing street traffic in order to prevent accidents like the one herewith shown The scene is on the Susquehanna river, at Binghamton, N. Y. What is known as the Rockbottom bridge collapsed, carrying with it an electric car loaded with passengers. There was screaming, fainting, splashing in the water, shattering of window glass and a wild scramble of men, women and children to save themselves from drowning.

Collapsing of Rock Bottom Bridge

Luckily, however, the imprisoned victims were rescued with but few sustaining serious injury.



View from Opposite Side

The Street Railway Review says: "The passengers were assisted to places of safety, where their bruises and injuries were given

prompt medical attention. The Rockbottom bridge was erected in 1874 at a cost of $35,-194. When it was built it was the finest bridge in that part of the country, but its builders probably did not anticipate the heavier loads that have gradually been imposed upon it by the increase in street traffic and the addition of electric railway cars. It was a double span bridge, resting upon masonry and concrete piers."

Eighty thousand of the Kaiser's soldiers in full equipment took part in the autumn maneuvers at Corbetha, Saxony, while the thermometer registered 120 in the sun. The ambulances were nearly as busy as in real war, picking up sun stricken soldiers instead of wounded men.

THEY TELEPHONE THE DOGS.

New System of Rescue Work on Deadly St. Bernard's Pass

St. Bernard's Pass is provided with numerous shelters at short distances from each other, all of which are in telephonic communication with the hospice, the place of refuge for travelers rescued from the snow. In the hospice are a large number of St. Bernard dogs kept by the Monks for rescue work. When the bell rings the dog on duty is given the proper signal and he goes direct to the proper shelter. This system, which has lately been inaugurated, saves the dog the former arduous task of patroling the pass on the chance of a stray traveler being found. The pass is under snow about eight months in the year.

AMERICA SUPPLYING THE WORLD WITH ROOFING.

The old materials for building roofs seem to be passing into oblivion since the discovery of ruberoid. Even in the tropics, where

Train of Natives Transporting Rubber Into the Interior of Africa.

the tile roof has held sway for centuries, the new material has made its way and the familiar old red tiles are disappearing. The substance is made only in America, but from here is shipped to the four quarters of the globe; the far northern Alaska; to the interior of Africa and to all the nations of Europe. In the colonization of British East Africa large shipments of the American

Roofing of Past and Present Ages Shown as a Result of Americanization of the Philippines

roofing are being made into that section. It is shipped to Chinde, a port about half way between Lorenzo Marquez and Zanzibar, and from there transported into the interior by trains of natives, who carry the rolls of the roofing for building new houses for the English settlers is shown in the illustration. The old and the new methods of roofing are illustrated in the picture showing a view at Legaspie, Philippine Islands. In all the smaller towns of Cuba, Porto Rico and the Philippne Islands, the dwelling houses are mostly built with thatched roofs. They are made of "nipa" leaves of native growth, but the new municipal school building just completed at Legaspi, has the modern roof.

Not that ruberoid is more substantial that the old tile or even the slate roofing, but it is preferred by builders because of its lightness, cheapness, flexibility, elasticity and other qualities. It is said to be proof against oxidation and corrosion, is waterproof, non-porous and will not melt.

The ingredients of ruberiod are something of a mystery. Its manufacture is a closely guarded secret and only its manufacturers know of its construction. It is known, however, that it is made of wool felt saturated with a rubber-like compound or gum. The secret of its manufacture lies in this gum. It is a thick liquid when the felt is saturated, resembling rubber in its crude state. There is, however, no rubber composition in the liquid. It contains no tar or oil and will not run from heat.

Observatory [Bourges, France. Covered with Ruberoid Roofing

PALACE HOTEL TRAIN.

A company proposes to build several trains composed of five palace cars each to run between New York and San Francisco. The appointments will include everything found in the finest hotels even to a palm garden and laundry, and will be without exception the finest affair on wheels in the world.

TITANIUM IN CAST IRON.

In a paper read before the New England Foundrymen's Association, Mr. S. S. Patterson states that he knows of no case in which it has been proved that bad castings were due to the presence of titanium, but, on the contrary, he believes that its presence increases the strength of the iron. The real objection to titanium, he says, arises rather in the smelting furnace. A titanic ore yields a slag difficult to melt, which obstructs the tuyere openings and, being cumulative, gradually builds up the crucible. Very little titanium is to be found elsewhere than in the slag. He suggests that with the higher temperature now usual in blast furnace practice, it may prove quite practicable to use titaniferous ores, which occur in large quantities.

At the British iron and steel institute which opened in September at Barrow-in-Fruness, J. E. Stead disclosed a discovery, by which he claimed that by simply heating dangerously crystalline steel to a certain temperature, however bad the steel, it is possible to restore it to its normal condition and even improve it.

OIL-GAS COMPANY TO ENLARGE.

To make extensive improvements in its manufacturing facilities in order to take care of its increasing trade, the Standard Blue Flame Oil Gas Co., 48 Clark St., Chicago, has placed some of its treasury stock on the market. This company is the only manufacturer of the celebrated wickless oil-gas ranges and heating stoves. Generating gas from ordinary kerosene oil and producing a clear, hot, blue flame, without wick,

Blue-Flame Oil Gas Burner.

odor, dirt or danger, this stove is declared by its manufacturers to mark a new era in home comforts and conveniences. The fuel is said to be 50 per cent cheaper than coal, gas or wood. The stoves and ranges are of scientific construction and very handsome. They are manufactured of the best material. The ranges are equipped with large warming ovens. The hot water coil furnished with each range is so arranged that the flame strikes it evenly all around and will heat a 30-gallon tank in a short time without interfering with cooking or baking.

TELLS ALL ABOUT WHISKY—SELECTED TOASTS, ETC.

Telling how whisky is made, giving the entire mechanical process of distillation, together with the history of whisky manufacture, etc., a little booklet just published by the M. T. Jones Distilling Co., 9 and 11 Exchange avenue, Chicago, will be found of great interest to many. In addition the booklet tells all about how whiskies are adulterated and how to test whisky to tell if it is adulterated. It gives several pages of selected toasts and recipes for making all the drinks known to moderns. This booklet will be sent free to all persons who in writing mention Popular Mechanics.

NEW VARIABLE SPEED MOTOR.

Thousands of users of small power electric motors have long wished for such a machine as the Thompson Electric Works, Chicago, has just put on the market. It is a motor with seven speeds, giving a variation of 60 per cent between high and low speed, and this is accomplished without any lowering of voltage. The change of speed is in the field winding of the machine and does away with the speed regulator heretofore necessary, and which so frequently burns out. Moreover, nearly the same horse power is secured on the low speed as on the high. The machine is iron clad, very simple and has but three parts.

A DICTIONARY OF TO-DAY.

Laird & Lee, that house so famed throughout the world for getting out up-to-date, convenient, labor-saving books, has come to the front again with a most unique new lexicon, decidedly the handiest and one of the handsomest works of the kind ever published. It contains all the very latest words, such as merger, acetylene, mimeograph, radium, radio-active, aerodrome, polonium, xenon, automobile, seepage, bacteria, zebrula, etc.; also all the important words for which one may search in vain through other dictionaries of the same size, such as folklore, cuneiform, kemitok, scenario, kimono, mercerize, referendum, gerrymander, ghetto, liquid air, nemesis, appendicitis, etc.

The old beaten paths of dictionary compilation are radically departed from in this new work and the effort of obtaining information is made easier, quicker and surer than ever before in such a reference book. To the modern student it gives words and definitions to be found in no other dictionary; to the office man it is indispensable as a desk book, because of its ready reference features; to the technical student or expert it gives the most modern technical terms, words arising from new discoveries, inventions, etc., that no other dictionary has ever attempted.

Two features make the volume invaluable as a desk book—words that require a capital initial, are recognized at sight, and any irregular verb form or plural, etc., is spelled out. See "dropped," under "drop," "deer," "drier," under "dry." Because the plural of "cayman" is not given, we know it must be "caymans," and the past of "droop" is "drooped," because not spelled out.

The etymology (word-building) is treated with especial care. Aside from an entire department in the back part of the book devoted to a synopsis of the principal prefixes, suffixes and stems of the language, with their meanings, use and origin, the body of the book contains the special etymology of most every word.

In addition the volume is exceedingly handsome. It is covered in a fine half-leather binding with an appropriate design pressed in gold. The interior contains many full-page colored illustrations of great educational value, the like of which was never before seen in a dictionary. The book is entitled "Webster's New Standard Dictionary." Price $1 50 to all who mention Popular Mechanics when writing. Published by Laird & Lee, Chicago.

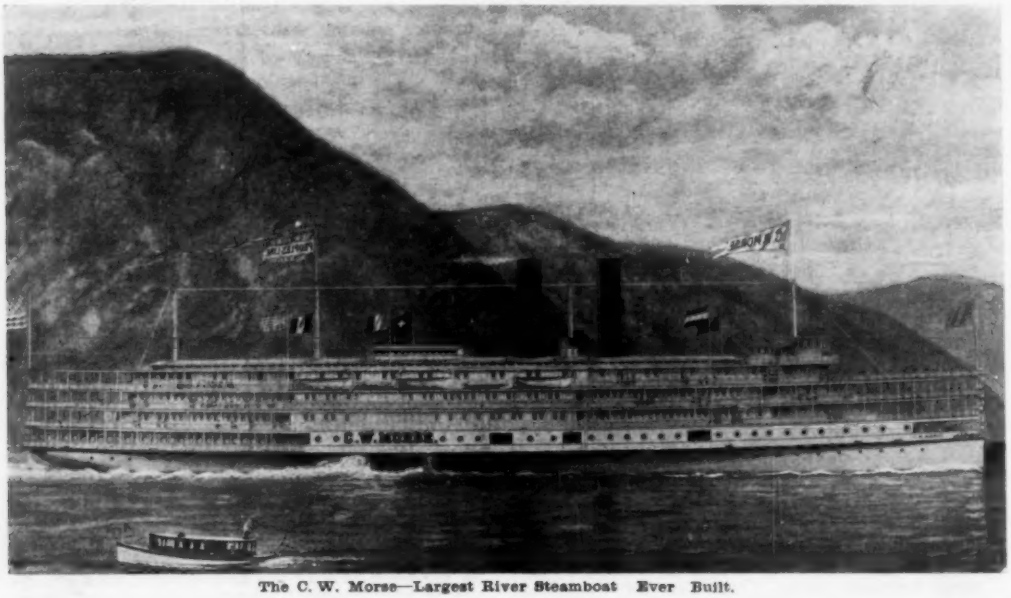
TELLS HOW VIOLINS AND MANDOLINS ARE MADE.

Telling all about how violins and mandolins are made, with pictures of the workshops, etc., the new pamphlet just issued by William Lewis & Son, 221 Wabash avenue, Chicago, will prove one of the most instructive and interesting booklets of the kind ever published. Many who read it will be amazed at the great amount of science, care and detail required in making a good instrument. It tells about the selection of the wood, the manner of bending in the proper curvature, the way of putting it together, all of which has subtle inuencfle on the tone. An arrangement has been made wherein a copy of this pamphlet will be sent free to all Popular Mechanics readers who in writing mention the name of Popular Mechanics.

LARGEST RIVER STEAMER IN WORLD.

New Boat to Ply on the Hudson Will Reveal Many New Departures

With many new departures from time honored customs, the new steel steamboat, C. W. Morse, being built for the People's Evening Line, the oldest steamboat line on the Hudson river, will be the largest river steamboat in the world. She will be 430 feet long over all with breadth over guards of 96 feet. The hull will be constructed of mild steel with a steel and iron deck house up to the saloon deck, something entirely new in Hudson river steamers.



The C. W. Morse—Largest River Steamboat Ever Built.

The American Shipbuilder says: There will be three full stateroom decks above the main deck, and the arrangement of rooms is also a new departure in this class of boats, all the rooms having outside ventilation, doing away as far as possible with that bugbear of the regular traveler, the "inside" room. All the staterooms in the three full tiers will have open air light and ventilation. The three tiers of state rooms all open in the grand saloon, both the upper decks being cut through with double galleries, both fore and aft the engine space. All the state rooms will be furnished with brass or iron beds, the lower berths in all the rooms being what is known as "double" while the larger rooms will be furnished with large double brass beds and other conveniences equal to a first class hotel.

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Measures curves, curved surfaces or straight work quick as a wink. Long distances as easily as short ones. Over and around corners as readily as plain surfaces. Is a cutting speed indicator for machine tools as well as an adding machine for estimators. In fact it is the fastest and most practical **all around** measure you ever saw at any price. It will pay you to send postal today for our new illustrated circular. It tells all about it.

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HERE is the boiled down story of the **LOFTIS SYSTEM** of selling **Diamonds** and **Watches** on **Easy Payments** to people hundreds of miles away and of whom we never heard until receiving their request for our **Catalogue**. Our catalogue shows the finest genuine Diamonds mounted in every conceivable and artistic form, at prices considerably lower than the home jewelers would ask for spot cash. From our catalogue you select any Diamond that you would like for yourself, or which you would like to give a friend or loved one; send one-fifth of the price, and very soon thereafter it will be handed to you at your home or place of business, as you prefer, with all express charges fully paid. Now, examine it as critically as you like and if it is not the best bargain you ever saw in Diamonds, and perfectly satisfactory in every way—send it back at our expense, and **your money will be refunded instantly.**

You will want to keep it for you can do so and pay the balance in eight equal monthly payments. We charge no interest; require no security and create no publicity; everything is confidential, prompt and satisfactory. Some people prefer not to send money in advance, in which case we send the Diamond to their Express Office or Bank with all charges paid, where they may call and examine it and make the first payment. Most persons, however, prefer to see the Diamond at home and have **absolute** possession of it and the fullest opportunity for examination, **before** deciding to buy. Every Diamond sold is guaranteed in writing, and **may be** exchanged at full price for a larger stone at any time in the future. We frequently exchange for Diamonds which we sold ten or twenty years ago. You need not hesitate to accept any representation which we make, and you may assure yourself on this point by asking your local bank about us. They will refer to their Commercial Agency records and tell you that our reliability, promptness or responsibility is not questioned in the business world. **You can make no mistake in buying a Diamond or Watch from us for we guarantee satisfaction.** If you want a watch—we sell them on the same easy terms. We are perhaps the largest retailers of high-grade Watches in America. Diamonds are advancing rapidly in value and are the best investment in sight at present. As a method for saving small amounts monthly, there is nothing equal to a Diamond purchase. You have the security in your possession; you have all the pleasure and prestige that comes from wearing a Diamond, and you have a certain annual increase of from ten to twenty per cent in value. If you prefer to pay cash, we will give you a bill of sale with any Diamond, giving you the option of returning the Diamond at any time within one year and receiving spot cash for full amount paid, less ten per cent, the reasonable cost of doing business. **For Example:** You may wear a Fifty Dollar Diamond for a year, then send it back to us and receive $45.00 in cash. You may have all the pleasure and prestige of wearing a beautiful Diamond a whole year for $5.00 or less than ten cents per week.

It is none too early to begin to think of Christmas. Better send for our Catalogue at once. With it before you, you can tell us exactly what you would like,—do it, then leave the rest to us under our written guarantee and you will be well satisfied.

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HOW STEAM LAUNDRIES WASH LACE CURTAINS.

In most cases the dirt is loose on the surface of the curtains, so that it can easily be removed without any rough treatment of the fabric.

In washing a bundle of such curtains, the first thing to be done is to sort them according to the predominant color. These lots are then treated separately in the washing machine, first about ten minutes with plain cold water. When this water has been run off, the goods are run for twenty-five to thirty minutes lukewarm with soap and water, and then for the same time with a fresh lot of soap, and rather hotter. It is absolutely essential that the machine shall not stand still for a moment, for if the wet curtains remain pressed together they print their colors off on to one another. This does not happen while they are in motion. Curtains of very delicate dyes should be wrapped separately in cloths before centrifuging, to prevent the dye from them getting on to the other curtains centrifuged with them.

The curtains are rinsed in the machine with both warm and cold water, the latter, which comes last, being soured with a little acetic acid, to liven the colors. The curtains are then centrifuged and starched.

If, in spite of every precaution, any blending has taken place, a weak chloride of lime bath should be given after the final rinsing. If the goods are not allowed to stay in this for longer than four or five minutes, it will generally rectify the mischief.—Exchange.

HYSTERESIS.

The question has frequently been raised as to whether the energy lost by hysteresis in a magnetic cycle is independent of the speed with which the cycle is completed, and very contradictory results have hitherto been published. The chief cause of uncertainty is the presence of Foucault currents, and in the experiments described in a paper read recently before the Paris Academy of Science by MM. C. E. Guye and B. Herzfield, an attempt has been made to eliminate this difficulty by the use of very fine wires, and a thermal method for measuring the energy dissipated in the wire has been adopted. Up to 1200 periods per second the energy consumed by hysteresis is independent of the velocity of the cycle.

"Want" and "For Sale" Ads, 2 cents per word, payable in advance. Replies may be sent to a number, care Popular Mechanics, and will be forwarded promptly without extra charge.

FOR SALE.

FOR SALE—Buffalo 1902 model automobile $300.00. Boiler and engine $30.00 each. Boiler shell drilled and riveted ready for tubes, $10.00. Address Box 523, Meyersdale, Pa.

FOR SALE OR EXCHANGE—Large Swiss music box in solid rosewood case; plays 8 airs; good as new; cost $100.00; want to exchange for fine mechanical tools or other property. Address Casey & Michael, Harrisonville, Meigs Co., Ohio.

FOR SALE—Castings for Bicycle Engines, 1¼ H. P., $8.00; 2 H. P., $12.00. Castings include all Iron and Bronze Castings, Cut Gears, two sheets of Blue Prints and also Spark Plug. W. Hoffman Motor Works, 1253 N. Halsted St., Chicago, Ill.

FOR SALE—1½ H. P. Thomas Motorcycle in good running order, $60.00. Bert E. Brown, 807 First avenue, West, Cedar Rapids, Iowa.

FOR SALE—Tuba, Tenor Trombone in case, Snare Drum, 8x12 Rotary Printing Press, 1 H. P. Engine and Boiler, Wood Lathe and Outfit, also some tools. Dirt cheap. Enclose stamp for reply. J. Homer Boals, Salineville, Ohio.

FOR SALE—Second-hand Gasoline Engines, all in first-class shape. 6 H. P. Opposed Cylinder Auto Engine, water cooled, $60.00; 2 H. P. Bicycle Engine, $30.00; 1½ H. P. Palmer Marine Engine, $50.00. W. Hoffman Motor Works, 1253 N. Halsted St., Chicago, Ill.

FOR SALE—$2,200 Merry-go-Round, very cheap; part cash and balance time. 14-inch auto boiler and engine. Box 523, Meyersdale, Pa.

THREE AUTOMOBILE Running Gears at bargain figures; ready for power. C. A. Coey & Co., 5311 Cottage Grove Ave., Chicago.

TWO REAL BARGAINS—A fine Mobile $295, worth $500; Murray Car $395, worth $550. C. A. Coey & Co., 5311 Cottage Grove Ave., Chicago.

FOR SALE—$2 down and $3 a month for 18 months buys 5 acres of rich undeveloped zinc and lead land in the very heart of the Missouri district. No difference where you live, an investment in this land will make you money. Send for my circulars and learn why. Address W. B. Sayler, Carthage, Mo.

ASHTABULA CO. FARMS for sale, by J. M. Seymour, 11 Fisk St., Ashtabula, Ohio.

CUBAN FRUIT LANDS, near Havana, $35 an acre. Box 147 Dundee, Mich.

MURRAY CAR, used only for demonstrating purposes, in first-class condition; extraordinary powerful machine; $350; big snap. Coey & Co., 5311 Cottage Grove Ave., Chicago, Ill.

FOR SALE—In growing town in Wayne Co., Pa., the following described property. House 24x28, two stories, with 14x30 one-story addition; store 20x48 with basement; large barn about 26x36 with shed attached, together with ¾ acres of land. Price, $800. This is a fine opportunity, and if you mean business address 754 Popular Mechanics.

FOR SALE—Bone cutter; 2 gents' wheels; lumiuum pigeon bands; 4 pairs White Fantail (Gibberts); also racing and squab-breeding Homers. Wm. Harris, 7 Elm St., Auburn, N. Y.

FOR SALE—Most up-to-date equipped laundry in modern city of twelve thousand. Satisfactory reasons; liberal terms. Address 753 Popular Mechanics.

FOR SALE—A Telescope wagon loader in good repair; used two seasons. Price, $25. J. A. Maley, Tyler, Minn.